Food Manufacture

Incorporating Canning, Packing, and Preserving

Vol. VIII. May, 1933 No. 5

Food Standards.

SOME INTERESTING views are expressed on another page with regard to the controversial question of jam standards. This really throws one back to the equally vexed question of food standards in general, concerning which we had some discussion a short time ago. Personally, we are inclined to attach greater importance to adequate and correct labelling than to the formulation of a complex system of hard-and-fast standards built up around the various names of foodstuffs in common use. After all, with the large number of edible raw materials at the manufacturers' disposal and the almost infinite permutations and combinations which are possible, taken in conjunction with the variety of processes to which these raw materials may be subjected, it becomes a hopeless task to frame any rigid system of rules governing the composition of the products. For iron or steel, or even bricks, it is another matter altogether.

Labelling.

As Mr. D. Henville, in an excellent contribution to the subject, points out, the name in itself means nothing. The essential point is that any article intended for consumption should be palatable and free from any substances which might have an adverse physiological effect, and, of course, *the really important thing is to state on the label openly, honestly, and in detail, the nature and quantities of the ingredients which have been used in the preparation of the article*. If this simple, straightforward plan were adopted, without any qualifications, reservations, and so on, there would be no need for any complicated, annoying rules and regulations which might easily become a nightmare to the manufacturer, cramping his initiative, and acting like a "millstone round his neck."

As for the public—they must be educated. In any case, once correct and adequate labelling is put into force, the public will soon learn to discriminate; moreover, food products will naturally sort themselves out on a quality-price basis which will serve as an excellent guide. Prosecutions will then be determined by the analyst finding something which is not declared on the label, particularly if that something is, in the opinion of a competent body, of a deleterious nature.

Out-of-Season Packs.

Many fruit canners seem to be under the impression that out-of-season packs (not fruit) which are intended to appeal to the masses, mainly on the score of cheapness, are able to pay for the overheads and keep the factory running. We venture the opinion, however, that if proper costing were carried out on the lines suggested in an article published in the present issue it would be found that these products were being sold at unprofitable rates, possibly in some cases at below the cost of production. We are all out for enterprise and the optimistic, progressive spirit, but this does not mean that foresight and caution to ensure reasonably controlled and organised growth should not be exercised. If the young British canning industry is not careful it will find that its legs are too weak for its body.

U.S.A. Canning.

There is a lesson to be learned from the present disastrous condition of the American canning industry. "All the ills that business flesh is heir to seem to have been inflicted upon the bowed and bloody head of the canning industry," remarks J. H. Burgess, the Vice-President of a Minneapolis bank. Over-production and ruinous prices are playing havoc, and not even the smart parading of

vitamins A, B, C, and D before an impoverished public during whirlwind advertising campaigns has served to bring any material relief to the situation. Mr. Burgess strongly urges getting back to the future-order basis: "The packer who has a good trade and puts up a quality product and wants to continue to live as a taxpayer and enfranchised citizen, will insist upon future orders from his trade or he will not pack."

We note that a number of canners of vegetables have informed the U.S. Department of Agriculture that they are planning to announce the quality of their products on their labels. This is certainly a step in the right direction.

Varieties for Canning.

We hear complaints that some of the smaller canners have not yet realised the necessity for packing the right variety of fruit, with unfortunate consequences. One would have scarcely thought this possible in view of trouble to which the Campden Research Station and the Ministry of Agriculture have gone in their efforts to spread information on this topic. Several excellent publications have been issued by these bodies, and they are always ready to give their advice and help, so that there is absolutely no excuse for packing varieties which were never intended by Nature to go inside a can.

It would appear that the price of raw materials for canning is still too high. The result is that good quality home-canned goods do not compare favourably in price with the foreign competitive article.

Passion Fruit Juice.

In the domain of flavours, so well has the ground been explored, real novelty is almost unknown. There are, however, quite a number of agreeable flavours, well known and appreciated in other parts of the world, which are relatively little known in this country.

Passion fruit supplies a case in point. The flavour of this fruit, though recalling in a manner that of black-currants, is more acid than this, and has a character which is quite individualistic. Some little time ago reference was made to an artificial passion fruit flavouring essence which had been placed on the market. At the B.I.F. we were interested to note one stall entirely devoted to a display of real passion fruit juice and passion fruit cordial.

The juice itself forms an excellent cocktail, which may be made more interesting by the addition of gin. Vermouth may also be added at discretion. As a flavouring for fruit salads the juice can also be warmly recommended. It would appear that the passion fruit flavour, so much and so justly appreciated in Australia, is no longer to be neglected by housewives and by foodstuff and beverage manufacturers in this country.

"Bees."

Last month we asked for more information in the enquiry columns (No. 1,181) on the subject of "bees," and this has been supplied by Dr. L. D. Galloway. He says that "Palestine Bees" or "Californian Bees" is the name given to whitish lumps formed by the association of yeast and one or more types of lactic bacteria (Mr. T. McLachlan informs us that it is an association of a symbiotic yeast, *Saccharomyces pyriformis* and a bacterium *B. vermiformè*). The yeast ferments sugar into alcohol, and the lactic fermentation imparts a pleasing flavour. Some additional source of nutriment such as white of egg, fruit, etc., assists the development of the "bees." The mixture is probably identical with what used to be known as the "ginger beer plant" (consisting of *Saccharomyces pyriformis* and *B. vermiforme*, as mentioned by Mr. McLachlan), and the modern name "bees" probably refers to the size of the lumps and their up and down movements, which are simply due to collection of gas (mainly carbon dioxide) causing the lumps to rise to the surface, where they give off the gas and then sink.

Bee wine can be a very intoxicating drink, since by periodic addition of sugar a beverage with 10 per cent. or more of alcohol can be obtained.

We take this opportunity of informing readers that Dr. Galloway has prepared an important article dealing with moulds in relation to foodstuffs for publication in this journal.

Nitrite Curing.

"There does not seem to be the slightest need for apprehension that nitrite-cured meats are harmful to health," concluded Mr. Osman Jones in a paper which he read on April 6 before the Society of Public Analysts. The same view was expressed by other authorities, Messrs. J. W. Black and T. Crosbie Walsh, in articles published two or three years ago in FOOD MANUFACTURE. More recently Mr. Black raised the subject at a meeting of the Food Group on March 22. Experiments have failed to detect any difference in the flavour, keeping quality, and appearance of nitrite-cured and nitrate-cured meats, and it seems improbable that the nitrate possesses any function other than the formation of nitrite by reduction.

In view of these findings and the fact that the use of nitrite in the preparation of cured meats is permitted in the United States and in Germany, the present anomalous position in this country is little short of ridiculous.

Industrial Research.

For a firm's technical staff to turn out occasional papers of a high scientific standard, and as a sort of by-product of their more technical research activities, is, we firmly believe, a matter of sound policy and one which affords definite evidence of the capabilities of the technical department of that firm. It goes far to establish public confidence and wins the admiration of those who are associated with the industry concerned.

An example is before us in the form of an extremely able paper by Mr. Theodore Rendle, Director of the Research Laboratory of Messrs. Chivers and Sons, Ltd., Cambridge. This paper (the *Analyst*, February, 1933, p. 69) is the outcome of a long investigation on some phases of fruit handling, involving a great many analyses of soft and stone fruits, and deals particularly with some observations on changes in raspberries after picking.

Changes in Raspberries.

Raspberries are perhaps the most difficult of all fruits to keep intact, owing to the rapidity of the changes which take place. While, in the main, these changes result from a continuation of life processes from within, the onset from without of organisms, such as yeasts, moulds, and other agents, plays its part, and physical damage of the skin and structure of the fruit makes the changes of the second kind more rapid and easy.

Mr. Rendle has shown that forty-eight hours is ample time (often it is less) for the fruit to change from a decidedly unripe state to one of maturity or ripeness. These changes continue even faster after the fruit is actually picked; there is definite alteration in texture, colour, and flavour in the course of two or three hours.

Accompanying the ripening process there occurs the production of a comparatively large amount of volatile organic substances not due to the action of micro-organisms. The pectic substances are subject to rapid change, with destruction of gelling power; application of heat arrests the change. Mr. Rendle suggests that the enzymic activity of raspberries is greater than in most British fruits, and is responsible for the above phenomena.

Cider.

Our congratulations to the Food Group on having arranged an extremely enjoyable and instructive visit to the National Fruit and Cider Institute and Research Station at Long Ashton, Bristol, on April 6. Under the guidance of Dr. T. Wallace (Deputy Director; the Director, Professor B. Barker, was unavoidably absent), P. Pickford, and V. Charley, the afternoon was spent in viewing the orchards, the experimental factory, and the laboratories. Lectures and demonstrations were given. In the evening, at the University of Bristol, two papers were read—one on cider orcharding and making by P. Pickford, the other on the chemistry and micro-biology of cider making by V. Charley.

The Long Ashton Station is doing good work. It is mostly through its activities that the British cider industry is being rapidly established on a modern, scientific footing, which in turn is contributing more than anything else to ensure a uniformly high standard of quality of British cider and the consequent permanent success of the industry.

The Ideal Pig.

A recent article in *The Times* emphasises the fact that it is a matter of urgency for every farmer to realise the obligations, as well as the privileges, which go with the pig marketing reorganisation to which we have previously made reference, and which, in all probability, will secure the required two-thirds majority of producers and be put in operation in June. To qualify for first place in the home market farmers are now required to guarantee regular supplies of first quality bacon pigs to the factories. The bacon and egg for breakfast is as dear to the average Englishman as the proverbial roast beef for dinner, and consumers will not tolerate lightly shortage of supplies or bacon that is not to their taste. The farmers have glibly argued that the consumers' taste is all wrong and have said that the lean imported bacon now in popular favour lacks flavour. It is, however, an axiom in salesmanship that the customer is always right, and if the bacon eater wants bacon of the lean Danish type the farmer will have to supply it, or kill the trade. The man who pays the piper will always call the tune. The first essential is to get the right breeding stock, and farmers should be supplied by pedigree breeders with stock carrying a proved record of performance. The National Pig Breeders' Association, which looks after the interests of five breeds, is preparing for the needs of the future. The pedigree that will really count will be that of performance judged by litter recording and not, as at present, fatness in the show ring. The ideal pig for the bacon trade—and, indeed, also for the pork trade—is described as "long, lean, prolific, and thrifty." The bacon curer wants the length and leanness and the breeder needs the qualities of fecundity and thriftiness to get a profit. It is gradually being realised, from a study of the above considerations, that the Large White type of pig, either pure or crossbred, will most nearly satisfy the ideal. Much has been done recently to educate the farmer; to take one example, the series of wireless talks broadcast on Wednesday evenings has been valuable in questions of breeding and feeding, and while wearying the average listener should have enlightened the pig farmer. The once humble pig has been brought into the limelight of publicity, and farmers will

have to see that its pedigree is beyond reproach from the bacon producing point of view.

Slaughter of Livestock.

The Reorganisation Commission for Fat Stock will shortly have to consider the report of a committee of the Economic Advisory Council on "The Slaughtering of Livestock," which has just been published by the Stationery Office. The object of the committee was "to consider and report on the question whether the present arrangements for the slaughtering of livestock for food are satisfactory from an economic standpoint." Apparently the committee found the present arrangements very unsatisfactory and, as a result, drastic proposals have been put forward. The committee recommends yet another control board to the already large number now functioning or about to function. This time it is a body to be known as the National Slaughterhouse Board, which will co-ordinate slaughtering facilities throughout the country. The object is to provide, through local authorities or private associations, a system of factory slaughterhouses similar to the packing houses now operating in America. It is maintained that the small slaughterhouse cannot utilise efficiently either the various by-products such as blood, guts, bones, etc., or the glandular products needed for medicinal purposes. The cost of utilising these glandular substances is said to be prohibitive in Great Britain, yet they are an important source of revenue to the larger slaughterhouses abroad. The committee does not lay all the blame on small private slaughterhouses, but criticises also the methods employed in many of the existing municipal abattoirs. The committee's suggestions will, we fear, raise opposition among many family butchers who take a personal pride in the meat they supply and pay good prices to the farmer for good beasts. The stock raiser cannot afford to lose the special advantages in the market that he now enjoys, and which would undoubtedly be lost in the proposed system of bureaucratic centralisation such as is proposed by the committee. The family butcher, or the food manufacturer who is making meat products, has a right to choose his material and deal direct with the producer, and not merely have to put up with what a well-meaning, but probably unimaginative, control board chooses to give him.

Refrigeration.

The problem of preserving fruits and vegetables by freezing is one that has claimed our attention on numerous occasions, and is one that must seriously occupy the consideration of all interested in food supplies. The paper by Barker and Morris summarised in our April issue throws some interesting light on the question as to whether there is a future for the preservation of fruits and vegetables by freezing. The authors state that there are two classes to be considered. First, there are fruits such as raspberries, gooseberries, currants, blackberries, sour cherries, and rhubarb, in which no appreciable change in colour or flavour occurs during frozen storage at 14° F. for six months or more. These materials can thus be preserved without special precautions. In the second class, which includes plums, sweet cherries, strawberries, peas, beans, and potatoes, changes of colour occur together with the production of objectionable flavours and odours, either during frozen storage or in the process of thawing. In this latter case special treatments are necessary, such as partial cooking which destroys the enzymes before freezing, or the addition of sugar or syrup, as is usual with strawberries. The writers suggest that frozen fruits may be used either for dessert purposes, such as fruit salads or sundaes, for catering—*e.g.*, fruit pies—or for bulk storage prior to canning or jam making. The results obtained seem to indicate that if reasonable care is taken in special cases there is a definite future for preserving by freezing.

Dried Mint.

Those of us who have gardens, in a corner of which a thrifty housewife once planted a sprig of mint, that has since meandered with care-free abandon among the tulips and the roses, might be surprised that anyone should take the trouble to adulterate dried mint. We should have thought it plentiful enough to preclude the necessity for fraud. Yet we read that, for the first time on record, a prosecution has been made and a conviction obtained against a firm that supplied what was called dried mint, but which really contained about 40 per cent. of the dried flavourless leaves of the *Ailanthus*. There may be no end to the frauds of life, but the limit seems to have been reached when a common herb of weedlike pertinacity is adulterated with a flavourless substitute. Frozen lamb and tinned peas are tolerable, but now, with adulterated mint sauce, even spring isn't what it used to be.

Empire Butter.

It is stated in the Report of the Medical Research Council for 1931-32 that a study of the vitamin content of Empire butters has been completed, and it has been found that Australian and New Zealand butters have a high and uniform potency in vitamins A and D. In this respect they are equal to the best summer butters produced in this country. The fat soluble vitamins in butter have a greater stability at low temperatures, and there is no fear of any appreciable loss of potency under the prevailing conditions of cold storage during shipment and distribution.

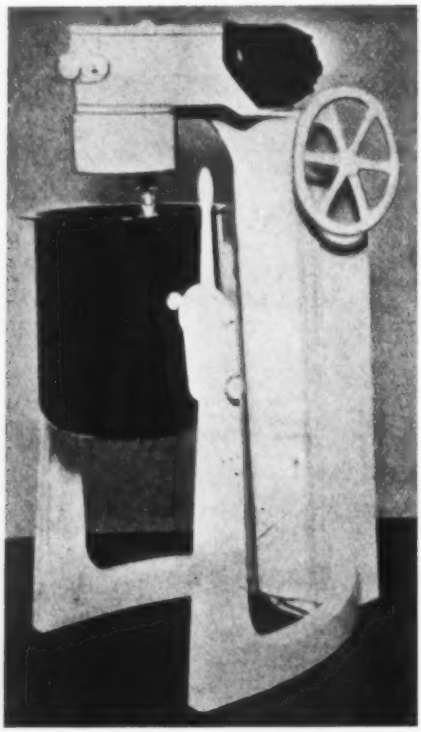
MAYONNAISE MANUFACTURE IN THE U.S.A.

● A comparison of English and American products, and a full account of American practice.

MAYONNAISE IN the U.S.A. is quite different from the product sold as mayonnaise in England. The official U.S. definition of mayonnaise is " the semi-solid emulsion of edible vegetable oil, egg yolk, or whole egg, a vinegar, and/or lemon juice, with one or more of the following: Salt, other seasoning commonly used in its preparation, sugar, and/or dextrose. The finished product contains not less than 50 per cent. of edible vegetable oil." The term semi-solid is officially interpreted to mean a consistency such as will not flow readily from a bottle, and will retain its shape to a degree when removed from the package, and for a time sufficiently long to admit of its use for the purpose to which this type of salad dressing is commonly applied. The original definition for mayonnaise called for a content of 78 per cent. total oil and egg yolk in place of 50 per cent. oil, and many commercial mayonnaise manufacturers market a product conforming to the original standard.

Within the last few years there has been a tremendous increase in the sale of " salad dressings " as distinct from mayonnaise, consisting essentially of the same ingredients but with less oil and egg content, and with added flour or cereal thickener, occasionally with gum. This product resembles in composition the salad cream or salad dressing marketed in England more closely than does American mayonnaise, but it is of a much heavier consistency, and is usually more bland in flavour and not so tart or spicy as English salad creams. Flour or other so-called stabilisers if used must be declared on the label, and true mayonnaise in the U.S.A. is never made with added thickeners. The low price of the salad dressing type of product has, of course, been a big factor in the growth of this branch of the business (the production in 1931 showed a 31 per cent. increase over 1930). At the same time the consuming public apparently does not fully appreciate the higher value of the genuine mayonnaise, and fails to distinguish sufficiently between true mayonnaise and salad dressing, with the result that production of mayonnaise only increased about 1 per cent. from 1930 to 1931. However, statistics of the U.S. Department of Commerce show that the value of commercially prepared mayonnaise increased from $100,000 in 1920 to over $14,000,000 in 1928, so that the industry has shown very rapid development.

Mayonnaise is a semi-perishable product, particularly during the summer months. Distribution must be carefully organised, and is a perplexing problem for manufacturers carrying on a nation-wide business. The shelf life of the mayonnaise in the retail stores is necessarily short, and unless the manufacturer follows up his sales very thoroughly he will be faced with unpleasant quantities of returned and unsaleable merchandise. Intensive competition in recent years has resulted in lower prices for the consumer, but has tempted some unscrupulous manufacturers to reduce the quality of their product. High-class brands of mayonnaise, however, are available



Glass-Lined Multimixer, Designed for Use in the Production of Mayonnaise, Salad Dressings, and Similar Products.

(By courtesy of the Enamelled Metal Products Corporation, Ltd.)

at competitive prices, and in the long run the manufacturer who maintains or improves the quality of his product will find a more enduring market.

As true mayonnaise contains no added thickener or stabiliser, the stability of the product will depend on the proper dispersion or emulsification of the oil in the vinegar aided by the eggs present. In view of the comparative youth of the industry, it is not surprising that manufacturers differ considerably in their methods of producing an emulsion, but intensive research and the application of colloid chemistry is solving some of the mysteries.

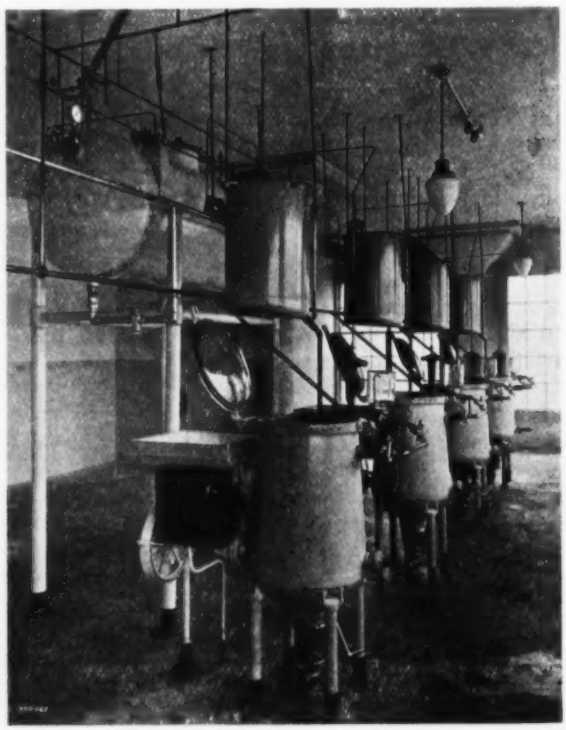
Before discussing manufacturing methods it will be interesting to consider the raw materials used and the properties to be looked for in selecting them:

Oil.

Oil forms the highest proportion of the final product, 80 per cent. of oil being used in some formulæ. The most commonly used are cottonseed oil and corn oil. At one time corn oil was largely used in the winter months, and cottonseed in the summer, as cottonseed contained stearines or similar compounds, which separated out on cooling and resulted in breakdown of the mayonnaise. Recently, however, "winterised" cottonseed oil is widely used. Winterised oil is chilled and filtered to remove the stearine bodies being sold for use in mayonnaise. Sesame oil is sometimes used where a characteristic flavour is desired—this oil having a pleasant nutty flavour. Arachis oil is not used in appreciable amounts in the U.S.A. for mayonnaise.

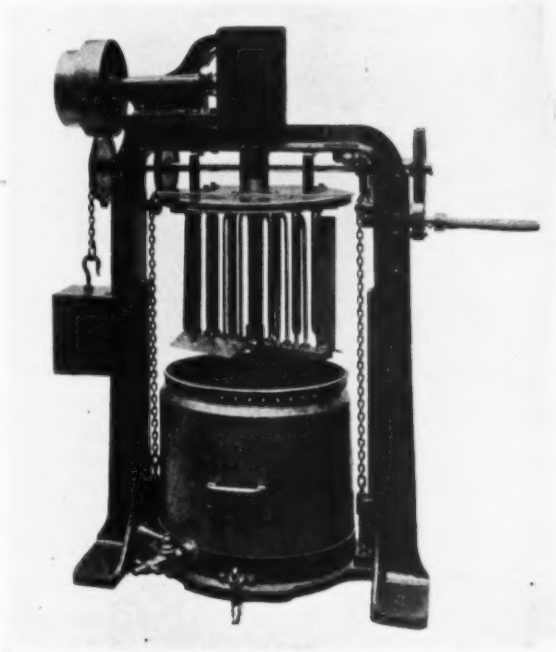
Considerable work has been done within the last few years on the development of suitable oils for mayonnaise manufacture, particularly from the point of view of resistance to rancidity. The question of rancidity is, of course, of particular importance in the U.S.A., where summer temperatures are so much higher than in England; olive oil, despite its attractive flavour when freshly made up in mayonnaise, would probably not be used even if available at competitive prices, because of its tendency to rancidity. It is usually specified that oil shall contain less than 0·05 per cent. of free fatty acid (as oleic) and shall show a negative Kreis test. Oil producers claim that a positive Kreis test does not always indicate potential rancidity, but in the absence of a surer test it appears to be safe from the user's viewpoint. Many users also insist that the oil shall remain clear at temperatures of 32° F.

Considerable attention has been paid to the handling and storage of oil. New steel drums are used for transporting the oil wherever possible. If barrels are employed, loss through seepage is more likely to occur, while used drums are difficult to clean, and may introduce contamination. The oil should be stored at temperatures below 60° F. to minimise undesirable flavour changes or metallic contamination. It has been recognised that small amounts of copper and iron dissolved in the oil exercise considerable catalytic influence in develop-



Battery of Four Mayonnaise Mixers.

(By courtesy of the Enamelled Metal Products Corporation, Ltd.)



Water-Cooled Whisking Machine fitted with 2-Speed Cone Drive.

(By courtesy of William Brierley, Collier and Hartley, Ltd.)

ing rancidity, and for this reason glass-lined equipment or more recently nickel, nickel alloys, or stainless steel equipment is largely employed. Tinned copper is suitable if the tinning is well maintained, but plain copper or brass are to be avoided, particularly where vinegar is to be handled. The question of metallic contamination is particularly important in cooked dressings. Thorough cleaning of any surfaces coming into contact with the oil is also essential, as a film of oxidised oil inside pipe lines or kettles will develop off-flavours and tend to promote rancidity very rapidly.

Eggs.

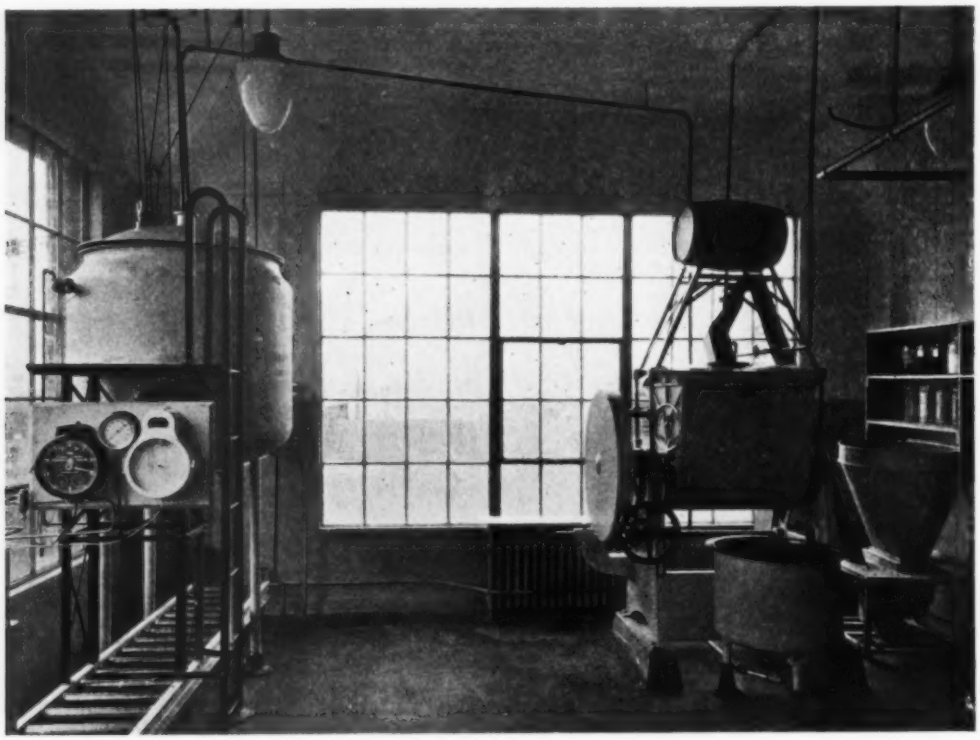
The next most important ingredient is the egg material. It appears to be generally recognised that, as the egg is used primarily as an emulsifying agent, then the white of the egg is more or less superfluous and in consequence the egg yolk alone is used. Frozen egg yolk has been popular in recent years. This is produced by freezing carefully selected egg yolks at about 10° F. and storing usually in 30-lb. tins at about 15° F. until ready for use. It has been found that the addition of a small amount of sugar or salt during the freezing will assist in maintaining the egg yolk in a homogeneous condition after thawing and prevent physical changes during storage, which render egg yolks frozen as such very difficult to use after a few weeks' storage. These frozen egg yolks are produced under very careful supervision and the bacterial count is kept low, comparing very favourably with fresh egg yolk produced under normal conditions in a mayonnaise plant. A minimum solid content of 43 per cent. is specified, and spring eggs, which contain more protein and lecithin (the essential emulsifying agent) with a strong colour, are selected for freezing. Usually from 5 to 10 per cent. of egg yolk is included in the mayonnaise formula, depending on the flavour or consistency required, and method of mixing adopted. If fresh eggs are employed they should be used as soon as possible after breaking, and kept at temperatures below 50° F. to minimise contamination.

Vinegar.

The vinegar used in mayonnaise in the U.S.A. is generally spirit vinegar of 10 per cent. acidity, although cider vinegar is preferred by some manufacturers on account of its pleasant flavour. Malt vinegar or flavoured vinegars, such as tarragon vinegar, are not widely employed in the U.S.A. for mayonnaise. About ½ gallon of 100 grain (10 per cent.) vinegar is used for 100 lb. of mayonnaise, the finished product having an acidity in the neighbourhood of ½ of 1 per cent., which will correspond to about 2·25 to 2·75 per cent. in the aqueous phase. The acetic acid content of the vinegar is, of course, very important in preventing spoilage of mayonnaise, as it retards the growth of yeasts and other micro-organisms. Recent research work of the Mayonnaise Manufacturers' Association shows that the acid content of the oil is an important factor in controlling rancidity. There is a fairly definite distribution of acid between the oil and the water phase, the ratio depending on the egg content of the batch; for mayonnaise commercially manufactured this ratio is about 1·10. An acidity of about 0·05 per cent. in the oil appears to be favourable for the prevention of rancidity, which corresponds to about 0·5 per cent. acidity in the mayonnaise. It is suggested, if a more acid flavour is desired, that citric acid or lemon juice be added, which is nearly insoluble in the oil phase. Edible lactic acid or lemon juice have been advocated as substitutes in whole or part for vinegar, but have not been generally adopted, as apart from questions of flavour there seems to be doubt as to the specific preservative effect of acids other than acetic. Lemon juice is often used as a flavouring material in conjunction with vinegar.

Flavourings.

The ingredients which are least important as far as quantity goes, but which exert a decisive influence in determining the flavour and saleability of the mayonnaise, are the spices and flavouring materials. About 1 per cent. of salt is commonly included in the batch and usually about the same amount of sugar, although some claim that sugar should be kept out as it is likely to suffer from spoilage due to fermentation. Mustard is the most important flavouring material. Yellow mustard flour of the English variety is preferred. It is milled fine and carefully selected to contain a minimum of dark specks; the flour is pressed to remove a portion of the fixed oil. The mustard may impart some colour to the mayonnaise,



Cooking Tank for Salad Dressing.

(By courtesy of the Enamelled Metal Products Corporation, Ltd.)

particularly if the egg content is low or poor in colour. The only other spices which can be used directly in mayonnaise are those which do not seriously affect the colour, such as white pepper or ginger, the former being a very popular ingredient. Paprika is sometimes used where a slight reddish tint is desired. A vinegar extract of celery seed is frequently used, and occasionally similar extracts of cloves or allspice, as it is found that the vinegar extract gives a fuller bodied flavour than the essential oil without the risk of darkening associated with the original spice. Essential oils do not seem to be employed to any great extent in mayonnaise, and it would seem that there would be room for an expert in the art of compounding flavours to introduce a characteristic mayonnaise from blended essential oils. The selection of spices is, of course, a matter of individual taste, but it is advisable to confine oneself to high quality spices very finely ground and carefully stored.

Manufacture.

The actual manufacture of the mayonnaise is still something of an art, or mystery, in spite of more or less intensive research during the last decade. Essentially mayonnaise is an emulsion of oil in vinegar stabilised by egg yolk. The rate and order of addition of ingredients, speed and temperature of mixing, and other factors must be considered, and each manufacturer has his special technique.

Commercial mayonnaise *mixing machines* consist essentially of a bowl in which a whisk or paddle can be moved around at varying speeds so as to provide a thorough whipping and agitating of the contents. Mixing under vacuum is not common. Many commercial mayonnaises have up to 10 per cent. of air by volume incorporated when filled into the jar. Most manufacturers start off the batch by mixing the water (if any), a part of the vinegar and the spices, then beating up the eggs thoroughly with this mixture (operating the machine at high speed); the speed of the mixer is then cut down and the oil added at a uniform predetermined rate (most mayonnaise mixers are provided with oil reservoirs which permit of the adjustment), generally arranged so that the oil for a 15-gallon batch is added in about twenty minutes. Mixing is continued for a short time and the rest of the vinegar added.

The mixed batch is then filled as soon as possible into the final containers. It is desirable to fill as rapidly as possible, not only to avoid contamination or exposure to air, but also because the mixed batch thickens up or tends to "set" shortly after making, and the resulting product will be less stable if this "setting up" process takes place during filling instead of in the jar. It seems to be generally recognised that a temperature of 60° to 70° F. is best not only in the ingredients, but in the surrounding air, in order to obtain the best mayonnaise. Actual manufacturing practice reveals many differences of opinion, some adding the vinegar at the beginning,

some at the end, some with the oil, depending presumably on proportion of ingredients and type of mixer.

Viscolising or *homogenising* of mayonnaise is unnecessary and probably impracticable; colloid mills tend to produce a thin consistency. For salad dressings with less oil and egg present, homogenisers or colloid mills offer many advantages, and have been used successfully by some manufacturers. Much work has been and is being carried out on the emulsification process, particularly from the point of view of controlling the consistency and stability of the manufactured mayonnaise.

Consistency.

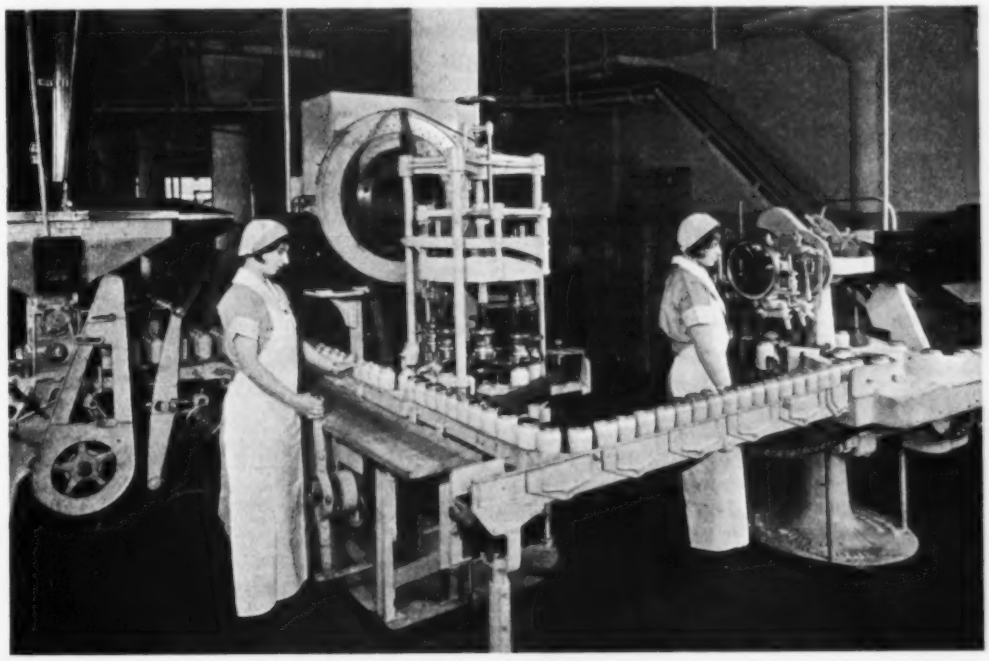
Consistency is, of course, of considerable importance from the consumer's viewpoint, and stability or resistance to separation is a serious problem for the manufacturer. Many manufacturers make systematic tests on the viscosity or consistency of the mayonnaise. The modified mobilometer developed by D. M. Gray has been used for this purpose, the consistency being obtained by a direct reading of the time taken for the standard mobilometer plunger to fall through a definite depth of mayonnaise. Using the mobilometer, the stability or resistance to separation due to agitation can be estimated by measuring the number of "plunges" of the mobilometer under controlled conditions necessary to cause breakdown of the mayonnaise. Recently the research department of the Mayonnaise Manufacturers' Association has developed an instrument called the "plumit," on which the thickness of the mayonnaise is recorded by measuring on a scale the depth to which the standard "plumit" penetrates the mayonnaise with standardised testing conditions. The resistance to separation is determined by taking "plumit" readings after definite periods of shaking or agitating the mayonnaise.

Stability.

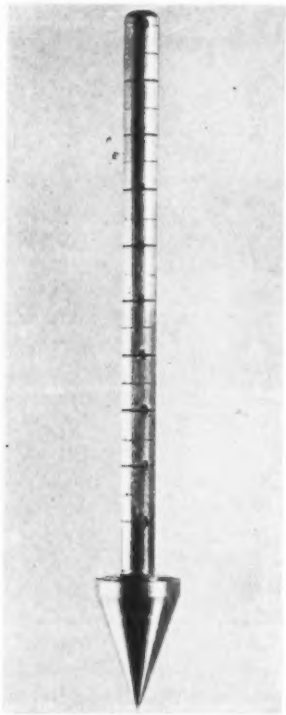
There does not seem to be any definite relationship between the initial consistency and the stability: one mayonnaise will apparently get thicker after shaking, whereas another of the same initial consistency will break down entirely. Microscopic examination of the original mayonnaise affords some explanation of the differences in behaviour, but continued study of the actual mixing of the batch in the light of modern knowledge of colloidal chemistry is necessary before the manufacture can be classified as a science rather than an art. Separation of the mayonnaise can also be brought about by extremes of heat and cold. Most commercial brands of mayonnaise will stand exposure to 32° F. for forty-eight hours without breaking down. Exposure to 20° F. (which can easily take place during the winter months in the U.S.A. during shipping or storage) sometimes results in breaking down due to the separation of the emulsion. The conditions necessary to prevent this breakdown do not appear to be clearly defined, some brands appearing to be very resistant to freezing, due presumably to the technique of the mixing process and to a proper balance of ingredients.

Rancidity.

Rancidity is another problem to be considered in the manufacture and storage of mayonnaise. Sometimes



Filling, Capping, and Labelling Mayonnaise.
(By courtesy of the Filler Machine Company, U.S.A.)



"Plumit" Used for Measuring the Consistency of Mayonnaise.

(By courtesy of the Mayonnaise Manufacturers' Association of America.)

true rancidity which is due to the development of off-flavours in the oil present is confused with staleness or unpleasant flavours produced by careless selection of ingredients—*e.g.*, eggs—or by actual spoilage organisms. The risk of rancidity can be kept to a minimum by careful selection and inspection of oil supplies, followed up by proper storage, avoidance of metallic contamination, and thorough cleansing of equipment.

The type of package is of considerable importance in influencing the development of rancidity after the mayonnaise has been packed. At the present time glass jars, sealed with a screw cap having a pulp liner faced with oil paper waxed all over, are the most popular package. It is important that the oil paper be impervious to vinegar, and that the coating be uniform to prevent possible off-flavours penetrating the mayonnaise from the oil liner.

Packing the mayonnaise under vacuum does not appear to be of any advantage. A considerable amount of air is incorporated in the mayonnaise during manufacture, and any vacuum applied during the sealing process will only remove air from the headspace, and not from the mayonnaise itself, and the seeping of air from the mayonnaise will gradually reduce the vacuum on standing, and may actually bring about separation at the surface. It is an interesting fact that whereas the surface layer of mayonnaise freely exposed to the air will develop rancidity, yet the air actually incorporated in the batch apparently exerts little effect on the oil. The whole problem of the influence of air incorporated in the mayonnaise on the stability of the mixture deserves more study than it has so far received. Surface discoloration of the mayonnaise may occur if the closure is not effective or if the spices, particularly the mustard, are not carefully selected.

Spoilage.

Spoilage due to micro-organisms is comparatively rare. Spoilage bacteria may be introduced with the egg yolk, particularly if eggs or frozen yolks of unknown history are used, or careless handling of the egg material is permitted. In some instances spoilage in dressings containing mayonnaise has resulted from organisms present in the spices, but this should not occur if fresh spices from a reputable manufacturer are used. The acidity of the mayonnaise is a vital factor in preventing the growth of these undesirable organisms, and an acidity much below 0·5 per cent. may lead to trouble. Plant sanitation is of major importance in preventing contamination of the product with yeasts, moulds, or bacteria. Hot water should be plentifully available, and all parts of mixing equipment, storage tanks, pipe lines, and filling machines must be thoroughly cleaned every day. Spoilage with yeasts or moulds is not very likely to take place in properly prepared mayonnaise in properly sealed jars, but is more likely to occur in relish spreads prepared from mayonnaise mixed with chopped olives, pimentoes, sweet pickles, and the like. With products of this type, the moisture content is higher than in mayonnaise, and the sugar present affords a favourable medium for yeasts. It is advisable to sterilise by heating the various ingredients before mixing with the mayonnaise. Many products of this type have appeared on the market in recent years, and together with the so-called salad dressings they offer formidable competition to true mayonnaise, particularly under present conditions.

As can be seen from the above brief review, the mayonnaise manufacturer has many technical problems to be solved in the manufacturing process, and in many factories the mixing is still a secret operation carefully guarded, but there is no doubt that before many years the accumulation of data from careful experiments from many sources will go far to develop a scientifically controlled manufacturing process for a product which originated in a humble kitchen.

The Explosion at Mitcham

MESSRS. W. J. BUSH AND CO., LTD., inform us that the recent explosion at their Mitcham factory will only interfere with a section of their business and that arrangements have already been made for the continuation of the supplies represented by this section. At the same time, the company wish to express their deep appreciation of the many messages of sympathy that have been received from various sources.

RANCIDITY

A SUMMARY OF RECENT VIEWS

THERE ARE many causes for rancidity in oils, fats, and cereal products, and our knowledge of these is far from complete.

According to Bolton, when rancidity is the result of age, the factors which have caused it are generally exposure to light and heat, air and moisture being minor factors. If, however, rapid development takes place in the case of a freshly prepared oil, the cause is more often the result of the activity of organised bodies, such as moulds and, to a lesser extent, bacteria. The rapid development of rancidity may be due to autoxidation, starting in the early stage of the oil's history and afterwards proceeding catalytically.

A survey of the literature reveals at least three general types of fat deterioration, each considered as rancidity, although the processes of decomposition and end products obtained differ considerably. According to Triebold, the three main types of deterioration are *oxidative*, *hydrolytic*, and *ketonic* rancidity.

In the first case the rancidity is caused by the addition of molecular oxygen to unsaturated glycerides, with the formation of peroxide- or oxide-like compounds, which subsequently decompose into aldehydes, ketones, and fatty acids. This deterioration may take place in all fats which contain unsaturated glycerides; hence all the edible fats are liable to spoilage by this means.

In the second type of spoilage the glycerides are hydrolysed, and fatty acids are liberated as end products. The development of butyric acid in dairy products is an example of this.

Ketonic rancidity may occur in fats that contain nitrogenous impurities—coconut oil is an example. The action of certain moulds on lower members of the saturated fatty acid series sets up a deterioration with the production of methyl ketones as end products.

From what has been said it will be seen that rancidity development in edible shortening agents and baked articles falls into the class of oxidative rancidity.

Rancidity in Cooked Cereal Products.

Very little work seems to have been published on the development of rancidity in cereal products themselves. In such preparations from which the embryo has been removed and no other fat added, the risk of rancidity development is slight. The most comprehensive survey of rancidity in cooked goods, that has come to our notice, is contained in a paper by Triebold (*Cereal Chemistry*, vol. 8, 1931, p. 518) and two by Triebold and Bailey (*Cereal Chemistry*, vol. 9, 1932, p. 50, and vol. 9, 1932, p. 91). It is proposed here to give a short résumé of these papers. Those who desire further details should study the original papers, together with the extensive bibliography to be found therein.

Tests for Oxidative Rancidity.

The most common tests used have been colour tests, of which the most important have been the peroxide, aldehyde, and Kreis tests. The *peroxide tests*, which were applied by a number of workers, should be particularly applicable, since peroxides are the first products of oxidative rancidity. Von Fellenberg claims that the *fuchsin sulphurous acid test* is most satisfactory.

The most widely used test is the *Kreis test*, which consists in thoroughly mixing 1 c.c. of fat or oil with 1 c.c. of concentrated hydrochloric acid, and then adding 1 c.c. of a 1 per cent. solution of phloroglucinol in ether. If, after thorough mixing, the separated acid layer has acquired a red or pink coloration, the oil is rancid, and the intensity of the colour is an indication of the degree of rancidity.

According to Bolton, *Kerr's modification of the Kreis test* is probably one of the best for the detection of rancidity and of incipient rancidity. Kerr modified the Kreis test so that it served as a means of determining degree of rancidity. He shook 10 c.c. of the fat with 10 c.c. concentrated hydrochloric acid and 10 c.c. of a 0·1 per cent. solution of phloroglucinol in ether. If a red colour developed in the acid layer, he diluted the original oil or fat with kerosene until a dilution was reached where no colour reaction was obtained. The amount of dilution required was an index of the degree of rancidity. A positive test for a dilution of 1 part of fat in 20 parts of kerosene would indicate a degree of rancidity evident to taste and smell. Holm and Greenbank found that the intensity of the colour produced in the Kreis test was directly proportional to the amount of oxygen absorbed by the fat.

Issoglio's Oxidisability Value.

Kerr's modification of the above test provides a measure of the water-soluble oxidisable bodies which are produced under the specific conditions of the test and gives an arbitrary figure by which the extent of rancidity may be assessed. 25 gm. of the fat are heated with 100 c.c. of distilled water at 100° C. for two hours with constant shaking. The aqueous portion is separated

from the rest by passing it through a wet filter paper. The filtrate is made up to 100 c.c., of which 10 c.c. are boiled for five minutes with 50 c.c. N/100 potassium permanganate. The liquor is cooled, and 10 c.c. sulphuric acid (1 in 5) and 50 c.c. N/100 oxalic acid are added. The solution is heated and titrated with N/100 potassium permanganate. The oxidisability value is the number of milligrams of oxygen required to oxidise the water-soluble matter from 100 gm. of fat.

Susceptibility of Fats to Autoxidation.

Possibly the best method for studying the susceptibility of a fat to oxidative rancidity is the rate of methylene blue reduction. In Davies' modification of this test the fat to be examined is mixed with methylene blue and emulsified in skim milk. This mixture is incubated at 37° C., and the blue colour reduced by the milk reductase. After all the colour has disappeared the tubes are shaken vigorously for fifteen seconds and allowed to stand two minutes. The amount of restoration of colour at the end of this period is a measure of the oxidation capacities of the fat.

There are several factors that influence oxidative rancidity. Greenbank and Holm found that fatty acids decreased the length of induction period of oxygen absorption of fats, the effect being greatest with the longer chain acids. Moisture on the other hand increased the length of induction period; thus it has a retarding effect on oxidative rancidity. Fine and Olsen showed that *moisture* slowed up the oxidative deterioration of stored grain products. Triebold claims to have obtained similar results with stored crackers, and Holm, Wright and Greenbank have had the same experience with powdered milks. How the moisture does retard rancidity is difficult to explain. Greenbank and Holm believe that water may extract catalysing substances from the fat, or that it may cause the oxidation to go straight to the acid stage, instead of stopping at the aldehyde stage with the production of a rancid odour and taste. *Metals* are powerful catalysts in the oxidative deterioration of fats and even traces effect a vigorous catalysis. *High temperatures* and *light* are also catalysts for the oxidation of fats, but the most important factor is the *presence of oxygen*. Vacuum storage is an efficient method of retarding the oxidative deterioration of fats.

Anti-Oxygenic Catalysts.

Much work has been done on the possibility of using anti-oxygenic catalysts to prevent or retard the autoxidation of fats. There is a number of substances which are known to retard the autoxidation of fats (*e.g.*, *alpha*-naphthol, quinone, etc.), but on account of their possible toxic action on foods their commercial application has not been attempted so far. It appears from the literature that an anti-oxygenic substance is present in wheat flour. Mattill found that wheat germ oil exerted a protective action in preventing the oxidative destruction of the vitamins A and E, and postulated that the sterols present in the oil were responsible for this action. Triebold, studying the relation of shortening agents to the keeping quality of crackers, found certain samples exhibited much better keeping qualities than the shortening agents would warrant. He explained this on the basis that the wheat oil present in the cracker flour contained some substance which prevented the rapid oxidation of the shortening. This, by the way, is in direct contradiction to the general view that wheat oil aids in the oxidative deterioration of baked goods.

Static Oxidation Method for Crackers.

Triebold and Bailey have developed a method based on the one originally used by Greenbank and Holm as follows: A 100 gm. sample of crackers was ground to a meal, dried five hours at 70° C., transferred to a 500 c.c. Erlenmeyer flask, and tightly stoppered with a rubber stopper carrying two glass tubes. The flask was placed in a thermostat at 90° C., and connected by means of heavy walled suction tubing to an inlet tube, from a gas burette, and to an outlet tube, opening through a stopcock, on the top of the thermostat. Oxygen from a tank was allowed to flow through the system to insure the replacement of air by oxygen. Approximately ninety minutes were required for the system to come to equilibrium after being filled with oxygen, and the decrease in pressure within the system, considered as cubic centimetres of oxygen absorbed, was determined at hourly intervals.

By this method the authors have carried out a comprehensive series of controlled oxidation studies, and it was found that the keeping qualities of crackers were generally related to the length of induction period of the shortenings used in them, and also to the length of induction period of the crackers themselves.

The final conclusions reached were:

1. Shortenings stored unexposed to air retained their keeping qualities much better than those open to the air. A refrigerator temperature (10° C.) decreased the tendency of the shortenings to become rancid, but was not nearly so effective as the exclusion of air.

2. Iodine numbers of shortenings do not appear to be related to keeping qualities. Free fatty acid content, and to a greater extent the smoking temperatures of shortenings, are distinctly correlated with keeping qualities.

3. Crackers stored in carbon dioxide become rancid as quickly as when stored in air.

4. The oxidative deterioration of crackers was found to be favoured by an atmosphere of 0 per cent. relative humidity, while humidities of 1 per cent. or over appeared to be protective.

5. Reheating crackers for five-minute intervals at 400° F. for crisping was found to accelerate their oxidative deterioration. Temperature and length of baking of commercial crackers exerted no influence on the keeping quality, since the moisture content of the crackers was evidently high enough during the baking process to prevent the crackers from being excessively heated, even though the oven temperature was high or the length of baking long.

German Views on Rancidity.

It is interesting to note Dr. K. Täufel's views on the mechanism of rancidity development (*Chemische Umschau*, July, 1932, pp. 147-151).

The conception of rancidity has hardly progressed beyond the stage of a purely sensory impression. Notwithstanding the 150 years' existence of chemistry as an exact science, terms purporting to describe the condition of a fat, such as rancidity, acidity, "suetiness," etc., are used indiscriminately in the literature, and no dividing line can be set up between them.

The same remarks apply to the so-called "tests of rancidity" which have attempted to supplement the often misleading sensory impressions by objective proof. But such tests, however well-intentioned they may be, are subject to narrow limitations in their sphere of applicability, and only permit of very cautious and reserved conclusions.

There is, nevertheless, one point on which unanimity can be expressed, and that is, processes leading to rancidity are extraordinarily numerous and extraordinarily complicated; wide variations can take place in the medley of chemical and biochemical changes. Hence the task set before analytical chemistry is of an extremely formidable nature.

The latest investigations recognise two groups of processes as being particularly responsible for rancidity of fats. One type of rancidity can be traced to the primary breakdown of the unsaturated glycerides, while the other group of reactions embraces the changes undergone by originally saturated fatty acids. And it appears in this latter connection that the acids of medium molecular weight are most open to attack. There is also a third group of changes involving saponification of fats with liberation of the fatty acids. Nor should mention be omitted of those processes bound up with alterations in consistency—best defined as "suetiness" (Talgigwerden) which are also being at present subjected to investigation. Attention should finally be drawn to K. Richter's discovery of the soap-formation in water-containing fats, particularly margarine. It appears that under the influence of certain moulds an entirely unique mode of degradation ensues, further details of which are not yet known.

Rancidity Developed by Degradation of the Unsaturated Glycerides.—It is now definitely established that this type of change—known also as "oleic acid rancidity"—primarily involves autoxidation at the unsaturated linkages of the glycerides. So-called moloxides are recognised as being formed, but much mystery still surrounds their constitution and mode of formation. Some light on these substances is thrown by the recent work of C. H. Lea, described in the *Proceedings of the Royal Society* (1931, Series B, vol. 108, p. 175). Conspicuous among the numerous other breakdown products which have been detected (see Täufel and Müller, *Biochem. Zeitsch.*, 1930, vol. 219, p. 341) are various aldehydes, organic acids, and carbon dioxide. Heptyl- and nonyl-aldehydes have been detected.

Fat Rancidity due to Breakdown of Saturated Glycerides.—Fats containing water in which mould fungi are present are liable to decomposition by the latter, the brunt of the attack being borne by the saturated fatty acids of medium molecular weight. The actual substances responsible for the aroma of rancidity in such cases are of the nature of methyl ketones and occur in those cheeses—Roquefort, Gorgonzola, etc.—with a high fat content. Owing to the minute quantity in which these intensely odoriferous bodies are present in rancid foodstuffs, the usual chemical tests for ketones are not sufficiently sensitive. A special colour reaction for ketones has consequently been worked out (*Chem.-Zeit.*, 1932, vol. 56, p. 265), based upon the discovery that certain ketones condense with salicylic aldehyde to form characteristic raspberry-coloured products.

A BOOK OF HERBS AND CONDIMENTS

FOR its clear and concise style, no less than for the very great deal of information it contains, this small book should find a place on the bookshelf of everyone interested in the cultivation of herbs and the culinary application of both herbs and condiments.

The book is divided into three parts. The first of these deals with the cultivation and propagation of culinary herbs; the second with herb beers, wines, liqueurs, and teas; the third with condiments. Although the work is intended primarily for the housewife, amateur gardener, and general reader, the scope it covers is actually a good deal wider than such an aim alone would indicate. Mrs. Grieve is, of course, an authority on her subject, and has been described as the greatest of modern herbalists. Not the least of her present work's merits are its well-arranged index, handy size, and excellent typography. Author and publisher alike are to be congratulated.

F. V. W.

(*"Culinary Herbs and Condiments," by M. Grieve, F.R.H.S. 209 pages. William Heinemann (Medical Books) Ltd. 1933. Price 5s. net.*)

COST CONTROL in the CANNING INDUSTRY

By F. S. WILSON, A.C.W.A., Cost Accountant, Messrs. British Canners Ltd., London

DURING THE past seven years the canning of English fruits and vegetables has developed from a comparatively insignificant industry to one of national importance. The industry started as a subsidiary of some form of preserving business, or in some cases grew out of the coming together of a number of interested parties by reason of their association with fruit production or marketing, or because they had factories and labour without adequate employment.

It will be appreciated, therefore, that the industry started its career under a serious disadvantage—*i.e.*, lack of standardisation. This lack of deliberate and careful planning, now evident in the industry, is undoubtedly part of the current problem of price fixing.

Normally selling prices are determined on one of three bases or on a combination of them:

Trade practice.
Cost.
Estimate.

The fallacy of fixing selling prices by trade practice was glaringly illustrated in the printing industry some time ago. For years the prices were based on conventional estimates without any attempt to investigate costs, resulting in hazardous and unsatisfactory trading. With the adoption of a uniform and analytical system of costing in that industry, standard process rates are determined for estimating purposes that cover the standard costs of each printer. This eliminates the possibility of any one firm quoting prices ridiculously below those of other firms, which would have a detrimental effect on the industry as a whole.

There is some advance towards financial safety in using costs as the basis of selling prices, provided that they are arrived at with a near approach to accuracy. It must be remembered that costs which are not accurate are worse than no costs, because they are misleading. Not only is it necessary to analyse carefully prime costs, but also factory overhead expenses and distribution and selling costs. There is a widespread form of self-deception which is barring the way in many instances to a critical examination of manufacturing policy, owing to the cost accounts not indicating sharply enough the difference in production costs of the various products, and not showing the true relation of final costs (production costs inclusive of distribution and selling costs) to selling prices. The practice of indiscriminately applying overhead expenses as a common charge averaged over the entire range of products is in many industries a trade practice, and its fallacy is only realised when a competitor with a sound costing system comes along and, knowing that several lines are making losses, cuts them out and merely concentrates on those where profits are shown. Thus these firms take the trade from their less enterprising opponents, and the latter are left with losses they cannot pin down to any particular line and in the long run usually end by installing a costing system of their own.

Although selling prices in the canning industry may not be determined by costs alone, it is essential to know the margin of profit obtained or loss incurred by each line, and to adopt the manufacturing policy along those lines which are most profitable.

A few English canners have adopted the policy of erecting canneries in different parts of the country in order to minimise the risk of crops failing in one locality, or to obtain close proximity to raw materials and markets for finished products. In order to ascertain the relative efficiency of these factories it is essential to compile comparative costs and, like the printing industry, a standard costing system applied to the canning industry would be of immense value. To the small canner a simple system would suffice, but for a larger concern a more detailed system would be necessary, but the same principles should apply.

As the canning industry is highly seasonal, outlets should be found for by-products in order to utilise skilled and semi-skilled labour during the winter months, as difficulty might be found in obtaining the same labour year by year if factories concentrated upon canning alone. Unskilled labour would have to be trained each year, and this would obviously increase labour costs unless this point received its proper attention, and poor quality products might result. For instance, the very ripe fruit rejected as unfit for canning could be made into pulp during the season and later used in the production of jam. It should be remembered that the more work there is passing through a factory the bigger the turnover, and therefore the overhead costs per unit are lowered.

The elements of cost may be divided into the following categories:

1. Raw materials 2. Packing materials 3. Labour	= Prime cost		
4. Factory overhead expenses		= Factory cost	
5. Distribution 6. Selling expenses			= Final cost
7. Profit			= Selling price

Analysing each group separately, we have:

1. Raw Materials.

Chiefly these consist of fruit, vegetables, sugar, salt, and colour. Fruit and vegetables are usually purchased direct from the growers at prices either carriage paid or forward; in the latter case carriage to the cannery is added to the purchase price in order to ascertain the total delivered price. Some canners have made long term contracts with the growers to supply minimum quantities of fruit and vegetables at agreed prices. If these quantities are sufficient to cover a large percentage of the requirements they will nullify the effect of any fluctuations in market prices due to a glut or a shortage, and the canned goods estimates, too, can be prepared with a close degree of accuracy. If a canner grows his own fruit and vegetables he can determine the selling prices to his cannery and thereby completely ignore their real values. Fresh peas are usually delivered to the cannery before being vined, and the growers are paid on the weights obtained from the viners.

Careful records should be kept in a Goods Received Book at the cannery, showing the weights of fruit and vegetables delivered and the suppliers' names, and any shortage should be reported immediately to the supplier, otherwise they may not be acknowledged. When the invoices are received, the quantities charged for should be checked with those shown in the Goods Received Book before payment is made. If the entries are in order, the items appearing in the Goods Received Book should be initialled. By this method the amount of fruit and vegetables not invoiced at any given date is easily ascertained.

As fruit and vegetables comprise, on the whole, the largest single item of cost, their use should be rigidly controlled, for it is here that much waste may occur. Some fruits, such as strawberries, evaporate very quickly. Others, such as blackcurrants, may lose much weight through waste juice when strigged.

As yet English canned fruits and vegetables are not sold by weight in the home market, but for those firms operating under the National Mark, a minimum weight of fruit and vegetables should be filled into the cans. Here, again, large leakages which may not be apparent may occur through overfilling the cans, and some firms have found it necessary to weigh the amounts filled into each can in order to reduce waste. Accurate records should be kept of the output of cans filled, and in order to make the cost control more effective the manager should be supplied early every morning with details of the efficiency of the previous day's working. A most useful daily statement shows the weight of each fruit and vegetable delivered into the cannery, the weight canned, pulped, rejected as waste (stalks, etc.), and the difference.

E.g., Strawberries—

	Tons.	*Cwts.*	*Qrs.*	*Lbs.*	*Percentage.*
Canned ..	20	5	0	0	72·32
Pulped ..	5	0	0	0	17·86
(Weighed) Waste ..	1	15	0	0	6·25
Diff. ..	1	0	0	0	3·57
Delivered ..	28	0	0	0	100·00

This statement should assist the manager in tracing waste and leakages, and help him to reduce them considerably while the season is still in progress. If this information is worked out after the season is finished it is too late to rectify errors, and the result is invariably high waste figures and consequently high production costs. A good flexible costing system will save its own expense time after time if operated efficiently in this way.

Similarly, a daily statement should be prepared showing the amount of syrup and brine consumed in comparison with the standard quantity which should have been used.

E.g., *Canned Golden Plums.*

Syrup Consumed = 10,000 gal.
Standard = 9,000 ,,

Difference = Loss 1,000 ,,

Slight losses will occur through evaporation when the syrup is made, but big losses may occur at the syruper if effective cost control is not introduced and the manager advised immediately.

It should be borne in mind that fruit purchased at low prices is not always the cheapest; experience proves that in most cases the waste from cheap fruit is considerably higher than more expensive graded fruits, with the result that the cost per ton canned is higher.

Fruit unfit for canning (over-ripe, etc.) is disposed of in various ways, such as by making pulp which later may be sold or, as previously mentioned, made into jam during the winter months, thus forming winter work for the employees and increasing the output and turnover of the firm. The canning department should be credited with such fruit at agreed prices—*e.g.*, current market value of fruit only fit for pulp or jam. The balance must be borne by the fruit canning department. It will, therefore, be seen that the bigger the percentage of fruit canned the lower will be the cost per ton canned.

The raw material cost for every can of fruit or vegetables produced is ascertained by dividing the total cost of fruit, syrup, etc., by the number of cans produced, due regard being paid to the different sizes of cans filled.

2. Packing Materials.

These consist of cans, labels, and cases, the cost of which represents the second largest item. It is sometimes argued that the labels should form part of the advertising expense as they act as display material, and the factory manager quite rightly states that he could reduce the costs by using inexpensive "strip" labels. While both these points of view are quite sound, the arguments in favour of including them in the packing material expense are equally good. Personally, the writer considers them a necessary item of cost and favours including them in this latter section.

Packing-cases are often included in the cost of distribution, for they are used only for the purpose of transporting the canned goods from the cannery to the retail shop (usually because transport companies will not deliver them unless so packed), and they do not form part of the goods as purchased by the housewife. In the writer's opinion they should only be charged to distribu-

tion expense if the transport manager has control over the buying of the cases, the labour of making them up, and the factory storage of finished goods. More often than not this responsibility is borne by the factory manager, and for this reason they have here been termed packing materials.

A few canners make their own cans, but the majority buy them from manufacturers, with whom contracts are usually made extending over a few years. The canner can therefore tell what his delivered prices are at any time.

As previously mentioned, packing materials comprise the second largest unit of cost, and a close check should be kept on all waste containers. Notices posted up in the cannery illustrating the value of cans will do much to reduce the percentage of waste. The most popular types of packing-cases are wooden and fiberite, and the choice is usually made from a cost viewpoint. When comparing the two types, not only should the purchase price be compared, but the final costs—*i.e.*, purchase price plus cost of making up (labour, overheads, and sundry nails or gummed tape), saving on carriage of finished goods because of different tare weights, and saving in warehouse space and also of packing time.

3. Labour.

This item may be divided conveniently into two classes—direct and indirect. Direct labour is that which is connected with some operation or process which alters the shape or state of the goods being manufactured—*e.g.*, filling cans with ingredients. While indirect labour is necessary, it has no direct connection with any process or operation—*e.g.*, supervision and sweeping floors. Direct labour can be charged to a specific process or operation, whereas indirect must be allocated on arbitrary bases, and is therefore transferred to Section 4—Factory Overhead Expenses. The direct labour operations may be arranged under the following headings:

Fruit and vegetable receiving and sorting.
Can filling.
Processing (syruper, seamer, etc., to boxing from cooler).
Storage.
Labelling.
Packing.
Despatching.
Syrup and brine making.
Box making.

Records should be kept so that all wages can be analysed against the respective jobs undertaken by the employees and wages balanced with the payrolls. There are several methods of payment in common use, but in the canning industry payment is usually on a time or a straight piecework basis.

Labour, unlike some elements of cost, is directly controllable by the works manager, and his efficiency in works management is reflected largely in the labour costs. Outputs from each of the above operations should be recorded, and by dividing these into the wages the process labour costs are ascertained. Of course, a further dissection of fruit and vegetable receiving and sorting would be necessary, for some fruits require little or no sorting, whereas others require more handling—*e.g.*, blackcurrants.

It will be noticed that after the fruits and vegetables have been filled into cans the costs cease to vary with the different raw materials therein, and such costs as storage, labelling, etc., are common for all varieties of canned goods. If labour costs are to be of any use the time spent on each job must be accurately recorded; approximate figures are useless and do not reflect true costs.

4. Factory Overhead Expenses.

This covers all expenditure, with the exception of capital expenditure, relating to the manufacture of the finished goods that does not enter directly into the product or that cannot be directly allocated to specific items of production. The production expenditure which does enter directly into the products consists of raw and packing materials and direct labour. Factory overhead expenses consist of depreciation, repairs and maintenance, fuel, power, water, works salaries, indirect labour, works stationery, telephone, etc. It will be observed that these include both fixed charges, such as depreciation, and variable charges, such as fuel, the former being practically constant regardless of the production, while the latter may be said to vary with the output. This fact should be borne in mind when determining the effect of production on costs. It is a common practice to recover overhead expenses as a flat charge on all products, but its fallacy in the canning industry is obvious, as some raw materials are cleaned, sorted, etc., by hand, while others require the use of expensive machinery. Overhead expenses should therefore be analysed very carefully, and their recovery should be made on a time basis or as a process expense rate on direct labour.

5. Distribution.

Goods may be sold ex-works or delivered direct to customers by the firm's own vehicles or by outside contractors, or they may be despatched via depots. If depots are used the expenses must be added to the carriage costs in order to complete the actual distribution expenses. These expenses should be recorded in such a manner that the cost per ton for complete delivery from cannery to customer can be ascertained. Depots should justify their existence by saving in carriage costs as well as being a means of a better delivery service in the surrounding districts. For these reasons it is advisable for all big canners to engage a first-class transport manager, who should be able to effect a big saving in distribution costs.

6. Selling Expenses.

A number of canners sell the whole of their output to brokers, the prices quoted being usually ex-works, and no distribution or selling expenses are thereby incurred. A few of the larger canners, however, have developed

(*Continued on page* 173.)

THE MANUFACTURE OF SOY IN JAPAN

An ancient industry "goes modern." Here is an outline of present-day practice.

WESTERN STUDENTS of food manufacturing processes will be interested in the following outline of present methods adopted in Japan of preparing soy sauce or soy, a condiment which for centuries has enjoyed great popularity in that country and is now appearing on the market here. Particularly are the accompanying photographs of interest as affording evidence of the up-to-date character of the largest group of factories (belonging to the Noda Shoyu Co., Ltd.) engaged in the manufacture of this product.

Soy is a dark, reddish-brown, clear liquid, having a characteristic piquant, saline flavour. Analysis of the Kikkoman brand gave a total solid content of 37·6 to 38·1 per cent. The following is stated to represent the analysis of this sauce on a dry basis:

	Per Cent.
Mineral matter (including sodium chloride) 18·02 per cent.	19·70
Protein (N^s 6·25)	9·44
Sugar (as glucose)	5·99
Dextrin	1·06
Acetic acid	0·14
Lactic acid	0·65
Phosphoric acid (as P_2O_5)	0·48

The preparation is claimed to have nutrient and tonic properties, chiefly by virtue of the presence of amino acids and vitamins A, B, and D, apart from its general effect in stimulating the flow of digestive juices. Soy is stated to contain over 40 per cent. of proteins, together with about 0·2 per cent. of lecithin.

The first step in the manufacture of the Kikkoman soy is that of steaming batches of soya beans in vessels having the appearance of Bessemer converters employed in the manufacture of steel (see accompanying illustrations). The object of the steaming is to remove from the beans their toxic principles. While this operation is proceeding, batches of wheat grain are roasted in a series of revolving cylinders, after which it is chopped by means of special machinery.

The beans and wheat grain are mixed on the floor, allowed to remain there for four hours, and then transferred to a series of chambers, in which the mixture remains at a uniform temperature for four days. During this time natural germination and fermentation commences; presumably this largely consists in an initial breakdown of the protein matter.

An equal weight of a 15 to 20 per cent. pure brine is

Steaming Soya Beans.

Mixing the Steamed Beans with Roasted Wheat.

now added to the mixture, which is passed to tanks for continued fermentation. Each fermentation tank has a capacity of about 530 gallons, and there are 1,500 tanks in each room. The material in the tanks is kept at the constant temperature required for this process, and stirring is effected by the occasional introduction of compressed air. The process is often expedited by adding part of a previous brew to the mixture. Agitation is carried out every day in the summer and every week in the winter

This (the "Moromi") process takes about eighteen months to complete. The proteins are broken down to amino acids and the carbohydrates undergo partial fermentation to lactic and acetic acids. When the fermentation is complete the mash is subjected to pressure in two series of presses, in each of which the operation extends over two days.

After clarifying, the extract proceeds to the final operations of barrelling, bottling, marking, and labelling.

Judging from the photographs, careful attention has been given to the layout and hygienic condition of these soy factories. They are evidently well lighted and ventilated, and are equipped with up-to-date plant. It is understood that the processes are under the control of a staff of biochemists and bacteriologists. To many people all this will come as a matter of considerable surprise, as the prevailing idea is to regard soy making as a rather primitive native industry.

It is clear from the examination of other accounts of soy sauce manufacture that there is considerable variation in procedure. Thus the following represents the views of a writer in Bull. *Mat. Grasses*, November, 1932. p. 339. It is interesting to note that this is described as the method of preparing Worcester sauce:

An Alternative Method.

The most satisfactory mixture is one of equal weights of wheat and soya beans, to which are added one to three parts of water and one to six parts of coarse salt. The beans and salt are arranged in alternate layers in a pot. After a week, the wheat, previously roasted to a light brown colour and ground to flour, is added. The beans themselves are first boiled with a little water until just soft. The mass is then mixed to a homogeneous mixture and incorporated with a little rice or steamed barley. This added rice is first seeded with a yeast prepared in a special manner. It is cooked in steam until soft, and exposed on mats; a part is mixed with the yeast spores and left for a day at a temperature of 20° C. Then to arrive at ripening of the spores it is left for a long period in special rooms, and during development the temperature of the mass rises to almost 40° C. This culture is now spread over the remaining rice and left to mature in a cellar. After about three days, the culture is incorporated with the soya-wheat mass and put into small wooden vessels, being maintained at about 25° C., during which time it becomes covered with a white mould. The whole is then transferred to one large wooden vessel, the salt and water added, and the whole submitted to fermentation at as low a temperature as possible. The thick

A General View showing a Series of Retorts Used for Steaming the Beans.

The Fermentation Tanks.

grey paste is stirred several times a day and slowly liquefies and turns brown. The fermented mixture is filtered through hemp or cotton filters. This type of fermentation is rather long, but, according to a writer in *Allg. Oel und Fett Zeit.* for October, 1932, there are some sauces which are prepared as the result of a fermentation extending up to twenty years. Generally speaking, the longer the time of processing, the finer the sauce, and according to connoisseurs the best qualities are those of from three to five years.

In this process of fermentation, influenced by the high proportion of salt, a double lactic and acetic fermentation takes place, with conversion of starches into sugars. There are produced also aromatic compounds which impart to the sauce its piquancy. In cases of necessity, the time required for fermentation can be shortened by exposure to sunlight, the vessels being fitted with movable lids, while the filtered sauce is also exposed to sunlight to assist in clarification.

It is interesting to compare the results given by S. Blumenthal and C. Thuor (*Fruit Prods. Journ.*, 1932) of the average analyses of soy sauce shipped into U.S.A. over a period of three years, with the analysis quoted above:

Total solids	77·5	per cent.
Protein (N^x 6·25)	1·93	,,
Ash	9·40	,,
Salt	3·13	,,
Reducing sugars	19·62	,,
Cane sugar	29·70	,,

It is stated that, as a rule, soy sauce is diluted with black-strap molasses before exportation to America.

Worcester Sauce.

Blumenthal and Thuor state that soy sauce is the fundamental ingredient of Worcester sauce, and they give the following as a typical formula for a good quality grade of the latter:

Cider vinegar	50 gal.
Spiced vinegar	10 gal.
Soy sauce	15 gal.
Walnut catsup	15 gal.
Pure lime juice	1 pint
Terpeneless oil of lime	30 drops
Sugar	10 lb.
Table salt	15 lb.
Water to make	100 gal.
Galagum C	6 lb.

The spiced vinegar is made as follows:

White vinegar, 100 gr.	25 gal.
Cayenne pepper	10 lb.
Cloves, powdered	8 lb.
Allspice	3 lb.
Celery seed, powdered	2 lb.
Mace	1 lb.
Cinnamon	4 oz.
Coriander, powdered	8 oz.

[*The accompanying photographs have been reproduced by courtesy of the Noda Shoyu Co., Ltd., Noda, Japan.*]

The Sterilisation of Canned Foodstuffs

By H. Cheftel
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Part II.

Rate of Heat Penetration.

IN THE process of heat sterilisation the centre of the container calls for special consideration, since it is at the maximum distance from the source of heat. Fundamental importance also attaches to the time factor. It is noteworthy that no one temperature can be defined as *the* sterilising temperature, for all bacteria are killed after sufficient exposure to a temperature which is too high to permit of their development. A given product may therefore be sterilised by brief heating at a high temperature or by more prolonged heating at a lower temperature. To take but one example; the spores of certain resistant bacteria, which are rapidly killed off at 120° C., remain unharmed at 100° C. unless heated for a hundred times as long.

The first step to be taken in establishing the best sterilising standards for various products is the determination of the temperature at the centre of the tin throughout the heating period. Information must also be secured as to the time required for destruction at different temperatures of the most resistant bacteria. Bigelow[10] has carried out the most comprehensive investigations on heat penetration in the case of canned goods, his use of the thermo-electric couple permitting of exact and convenient measurements. We reproduce here some of his results, which are based upon a carefully controlled series of tests.

The speed of heat penetration is subject to the laws of conduction and convection. Conduction involves the transmission of heat from one molecule to another, whereas heat transmission by convection involves the mass movements of a liquid or gas which are induced by the thermal expansion of a portion of the medium. Convection currents induce a lively circulation of the fluid contents, which causes the central portion quickly to attain the retort temperature. But in the case of a solid and compact product, heat transmission depends solely upon conduction and therefore takes place much more slowly.

The dimensions of the container are naturally an important factor in heat transmission, and it need not be stressed that the larger the container the longer the period for attainment of a uniform temperature throughout. In the case of cylindrical tins, the height of which is greater than the diameter, the heat reaches the centre in a time roughly proportional to the square of the radius. This rule permits of approximate calculation of the period of heat penetration in tins of various shapes, provided the actual shape is known. It does not, however, apply with any degree of accuracy to compact products.

If two tins of the same shape and containing the same product are heated to different temperatures and finally retorted under such conditions that the period of sterilisation is the same in each case, that tin with the lower initial temperature heats up more rapidly than the other and the retort temperature will be attained by both tins in equal times. To make this point clearer, considering two tins with initial temperature of 60° and 90° C. respectively, a retort temperature of 120° C. will lead to the first tin increasing in temperature by 60° C. in the time occupied by a 30° C. rise in temperature of the second tin.

This fact is of little importance in the case of products which permit of rapid penetration of heat to the centre of the container, but it is a different matter where products are concerned which only transmit heat very slowly and do not even attain the temperature of the retort under the usual sterilisation conditions. The initial temperature then becomes an extremely important factor. In fact, the final temperature is of less importance than the time of exposure to a high temperature. The tin with the lower initial temperature always lags behind and is therefore exposed to the higher temperature for a shorter period.

In the United States the sterilisation of sweet potatoes is carried out at 115·5° C. for 95 minutes when the initial temperature is 82° C.[11] Under these conditions the product remains in the vicinity of 104° C. for 45 minutes. In startling contrast, it is only exposed to this temperature for 5 to 6 minutes when the initial temperature is 34° C. Similar conditions apply to the sterilisation of spinach. There is therefore no need to insist upon the importance of a high initial temperature when the product only transmits heat slowly, as in the case of spinach

and tomatoes, the rational sterilisation of which is only possible when the initial temperature at the centre of the tin is known and controlled.

When canning at high temperature, care should be taken that the initial temperature is constant. Once the tins have been sealed they should be passed on without delay to the retort, any abnormal delay leading to excessive cooling and ineffective sterilisation; the contents then act as an excellent nutrient medium for bacteria. The control of initial temperature is compulsory in the United States in the case of certain products.

High temperature seaming, which has been studied in particular by Magoon and Culpepper,[11] presents numerous other advantages, among which may be cited:

1. Considerable reduction in sterilising time, avoiding over-heating of the outer layers.

2. Shorter sterilising period places less strain upon the retorts.

3. Dissolved air is driven out and the internal pressure reduced.

4. Freedom from air exercises a very favourable influence in the case of products which may attack metal and cause colour changes.

Pre-heating of the canned product is often effected in the United States by means of heat-exhausters, through which the containers are passed immediately after seaming, the exhaust period varying from 5 to 20 minutes. A seaming temperature of 70° to 80° C. is usual, and the containers are passed to the retort without delay. The exhaust thus ensures a constant initial temperature.

The *cooling* of a can of preserved foodstuff follows the same laws as heating. Rapid cooling reduces the sterilising effect of retorting. It is difficult to achieve uniform cooling by mere exposure to the air as so much depends upon the prevailing temperature and the speed of air circulation. Rapid cooling is advantageous from the point of view of colour and appearance of the product, and should be practised in every case. For this reason, the duration of heating should be so arranged as to be sufficient in itself for complete sterilisation. The bluish-black marbled effect sometimes visible in the interior of cans containing peas or kidney beans is largely eliminated by following up sterilisation with an intense cooling operation.

Soluble salts or sugar slow down heat penetration, but their influence is only slight. Starch, on the other hand, exercises a very considerable influence, even in the low concentration of 2 per cent. It is interesting to note that in 6 per cent. concentration and upwards the time-temperature curves are nearly identical, showing that a 6 per cent. starch solution only transmits heat by conduction, convection currents having ceased completely. Larger quantities of starch make no appreciable difference, the conductivity of a 6 per cent. solution being approximately the same as a highly concentrated paste. A similar influence is probably exercised by other colloids, including gelatine and pectin, as previously noted by Bigelow.[9]

The behaviour of starch solutions is important in the case of products like peas and kidney beans, which are liable to disintegrate in the brine in which they are retorted, and it is probable that in such cases a second heating will have an entirely different effect. This point is important when it is desired to re-sterilise a product, as when making "dépotage."

Coming now to the retorting system, numerous experiments of Bigelow and other workers have shown that a retort of the conventional type yields similar results irrespective of whether heated by water or dry steam, both media transmitting heat equally well. Where slow heating-up is desirable, however, water-heated retorts are preferable, and the containers are initially immersed in cold water. But products calling for retorting at a temperature of 100° C. should be heated in dry steam retorts.

Rotating retorts are widely used in the United States and ensure thorough agitation of the product during heating, the containers being revolved on their axis at the rate of 11 revolutions per minute. This system is nevertheless useless for products which rapidly transmit heat and is inefficient when applied to excessively dense preserves or those which do not contain particles of sufficient size to aid the mixing process. Products for which it possesses great advantages are spinach, whole or cut tomatoes, cauliflower, and various fruits. When efficiently carried out, agitation not only increases the speed of heat penetration to the centre of the container, but permits of reduction in the retorting period. Furthermore, it ensures uniform distribution of heat and avoids overheating of the product at the periphery of the can. Rotating retorts are therefore of the utmost value in the sterilisation of milk or cream.

Period and Temperature of Sterilisation.

As already noted, these two factors are inseparably connected. Up to quite recently conditions adopted by the canning factories had been based upon empirical knowledge, but researches instituted in the United States by the Department of Agriculture, the National Canners' Association, the American Can Company, and various universities have led to standardisation of the conditions. Nor must mention be omitted in this connection of the researches of Meyer and Esty into the causes of botulism.

Mathematical calculation of time and temperature of sterilisation, as well as of the exact relations between variously shaped containers, have been established by Thompson[14] and Williamson and Adams.[15] Bigelow[9] has also outlined approximate methods which give reasonably good results in the cannery. Of course, none of the formulæ makes any claim to perfect accuracy, for the numerous factors which come into play only permit of control within certain limits. Sufficient data are

nevertheless available to avoid hit-and-miss methods and consequent grave errors. They have only been officially released by the National Canners' Association after subjection to both laboratory observation and large scale trials in the factories.

The following temperatures have been generally adopted in the United States:

For acid products	100° C. (212° F.)
For most legumes	115·5° C. (240° F.)
For most meats	120° C. (248° F.)
For certain slow conducting legumes such as spinach ..	122° C. (251° F.)

Summarising Recent Research.

Rapid sterilisation at high temperature has been justified in the case of dense products and the rate of heat penetration is proportional to the temperature of the retort. The thermal treatment of the product can thus be diminished, not only because of increased intensity of sterilisation at high temperature, but because heat then penetrates more rapidly to the centre of the can. Preheating and subsequent cooling thus avoid the disadvantages of a second retorting.

It is instructive to discuss the case of spinach, a particularly difficult product to treat under the best conditions. One is faced either by insufficient sterilisation or the scorching of the outermost layers by excessive heating. In this case the National Canners' Association advise as follows:

1. A maximum weight of drained product for each shape of container, so as to maintain the speed of heat penetration within the predetermined limits.

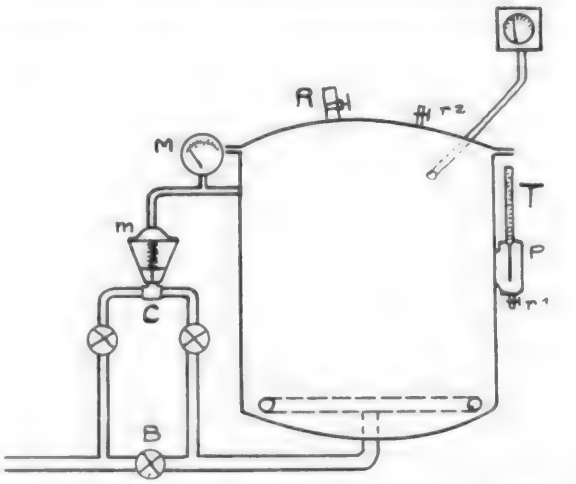
2. The initial temperature is fixed at 80° C. (176° F.), 50 minutes at 122° C. (251° F.) then sufficing for a 4/4 container. Chilling with water prevents overheating.

Retorting Temperature Control.

The temperature of the retort is frequently measured with the aid of a manometer, but since instruments of this type are graduated on the basis of air-free water vapour, the reading will not correspond to the actual temperature unless all the air has been driven out of the apparatus. An erroneous reading may also result if the tube connecting manometer and retort is unduly long. In any case, constant pressure and temperature are difficult to maintain when the speed of steam admission is regulated by hand.

In the United States, a mercury thermometer is a compulsory part of the equipment of each retort, and is located at a lateral port as indicated at P in the accompanying diagram, the 2 mm. exhaust cock r^1, which is kept always open, ensuring the circulation of vapour round the bulb. The thermometer reading will thus represent the exact temperature of the steam in the interior of the retort.

The upper part of the retort is equipped with a second 2 mm. cock r^2, and a 20 mm. cock R, the latter serving to exhaust the apparatus during the time the pressure is being increased, while the 2 mm. cock—like that attached to the thermometer—is always open. The two



continuous exhausting operations maintain an internal circulation of steam which in turn ensures a uniform temperature in all parts of the apparatus and eliminates the small quantities of air which are drawn in with the steam.

The retort is also equipped with a pressure gauge M fixed as near to the boiler as possible. The thermometer (and often the manometer also) is graduated both in pounds of steam pressure and degrees centigrade, and the initial exhaust is continued until the readings of the two instruments are equivalent, thus indicating complete expulsion of air. The 20 mm. cock may then be closed, and the retort is brought to the desired temperature in the specified time.

For the automatic regulation of pressure, the simplest arrangement is that indicated in the diagram. A membrane *m*, the position of which depends upon the retort pressure, covers the valve C which regulates the steam inflow. By means of a pressure-regulating spring the pressure in the retort can be varied within the temperature range of 110° to 122° C. To increase the pressure the cock B is opened, the latter being closed after completion of exhaust. Introduction of steam is then only made through the intermediary of the regulator C. Once the apparatus is in good adjustment the variations are of the order of ± 0·5° C. About 50 retorts have been equipped in France on these lines and satisfaction has been expressed in all cases.

American law demands that a maximum and minimum thermometer be fitted to each retort. At the end of each working day a Government inspector examines all records relating to sterilising operations. If a particular batch is suspected of not having been retorted under approved conditions, all the containers are kept under observation and examined by a skilled laboratory assistant.

But even when a fully equipped laboratory is not attached to the cannery, the manufacturer can efficiently control the course of sterilisation by carrying out incubation tests on samples withdrawn during the various stages of the manufacturing process. Attention may be directed, for example, to the detailed procedure for bacteriological control set forth by Thompson and

Cameron[16] at the close of their paper. Their method was established in the first place with a view to safeguarding the quality of pea and maize packs, but it is applicable in general to all non-acid vegetables.

As mentioned at the outset, bacterial contamination attains its maximum in the early morning as a result of stoppage for the night, and steadily declines throughout the day. Samples should therefore be drawn in the morning from the first crate of each line of manufacture, as well as from one of the last crates of the afternoon shift. The data thus rendered available will reveal the efficiency of the retorting operation in the case of cans respectively subject to the maximum and minimum of contamination. Samples should be withdrawn each day (even if an examination of all of them is not intended) and stored with a label permitting of identification of the day and hour of sampling.

At least 48 cans should be sampled on each occasion, 24 of these being kept in reserve in the event of future investigation being desired, while the remainder are at once incubated. Where cans of various shapes are being retorted, it is generally sufficient to keep under observation the commonest shape, provided, of course, that the same retorting conditions are applied to the other shapes, but it is inadvisable to carry out regular sampling of the large shapes such as 2/1 and 5/1, both on account of the large dimensions and the value of the product.

The 24 cans for incubation are split up into two equal lots, which are maintained at 37° C. (98·6° F.) and 55° C. (131° F.) respectively. This procedure should be adopted during the first five days of the test. If favourable results are obtained, the control need only be subsequently exercised each second or third day. But sampling should still be effected each day and the samples kept in reserve. Incubation at 55° C. serves (1) to reveal the presence of strictly thermophilic bacteria—*i.e.*, those which do not develop below 40° C. (104° F.)—and (2) to effect rapid development of facultative thermophilic bacteria—*i.e.*, those which would have developed at 37° C.—although more slowly. Six cans are opened after three days' incubation and six cans after five days'.

Incubation at 37° C. should indicate what is known as the commercial sterility of the product. In other words, it reveals whether those containers which are well cooled after issuing from the retort are likely to vary under the most unfavourable commercial conditions. Six containers are open five days after incubation and the remaining six after ten days. The following types of contamination are distinguished:

1. Flat sours without swelling.
2. Bulging due to anaerobic thermophilic bacteria.
3. Sulphur gas putrefaction.

Although not laying any claim to completeness, the above three categories represent the types of contamination most likely to occur in modern canneries.

Anaerobic bacteria which lead to swelling at 37° C., *but not at 55° C.*, are not usually sporogenic thermoresistant forms. In exceptional cases, however, the seams should be examined, as the defect nearly always arises from leaking cans.

Flat sours can be detected by a solution of indicator, brom-cresol purple serving for products of lower acidity than peas, and brom-cresol green for products of higher acidity such as green haricot beans and spinach. For the purpose of this test, a few drops of the indicator solution are added to a little of the syrup in a test tube, the appearance of a yellowish tint pointing to flat sours. Where this is detected only in containers incubated at 55° C., the danger is not so grave provided that they are well chilled after removing from the retort. It is nevertheless just as well to keep a careful eye on all details of the process, particularly in connection with the general hygiene of the factory and the speed of working. If flat sourness is manifested at 37° C., however, the danger is very real and requires immediate remedial measures.

Swelling indicates the presence of living spores of anaerobic thermophilic bacteria and is manifested both at 37° C. and 55° C.

The presence of bacteria which develop sulphur gases is revealed by the odour of rotten eggs and sometimes by blackening of the contents. Organisms of this type develop very rapidly at 55° C.—in three days at the outside. But their development is much slower at 37° C. Blackening is only met with in the case of products containing a relatively high proportion of sulphur compounds, among which may be mentioned peas, kidney beans, maize, fish, and meat.

The general rule to be observed is to secure the advice of a competent laboratory as soon as contamination has been seen to assume grave proportions. The measures to be taken are generally the same in all cases, and the previous discussion on the influence of bacterial multiplication, the influence of wooden apparatus, and the hygienic conditions of the factory will serve as a guide. It is also necessary to keep a close eye on the retorting stage. When a regular control has been instituted observations should be entered in a notebook in order to keep a record of all potentially valuable data.

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[The above information has been taken from Bulletin No. 2, "La Stérilisation des Conserves par la Chaleur," H. Cheftel, Établts. J. J. Carnaud, Forges de Basse-Indre., Laboratoires de Recherches Biologiques, Paris, August, 1931.]

FLOUR BLEACHING

Mr. T. H. Fairbrother, M.Sc., F.I.C.,
reviews the present position

THE PRACTICE of bleaching flour by chemical means was introduced solely to alter the appearance of the flour—that is, to whiten the flour. The quality of flour and its value, regarded from the trade point of view, depend upon two factors, its baking qualities and its appearance, of which colour (*i.e.*, whiteness) has come to be an important consideration. Artificial bleaching by chemical means is only an accelerated form of a natural process known as "ageing." It is well known that flour after the elapse of several months becomes much whiter owing to a slow oxidation of the yellow pigment, carotin, of the endosperm. Bleaching by artificial means was started in this country originally to meet the competition of American millers in English markets with flour that had been several weeks on the way and had naturally aged and become white.

Before the question of bleaching processes can be dealt with adequately, it is first necessary to discover the factors that produce colour in flour. Flour may be coloured from several causes: (*a*) dirt due to inadequate cleaning or introduced during milling, (*b*) presence of small particles of bran due to inadequate purification in the process of milling, (*c*) the yellow pigment carotin present in the endosperm of the wheat berry. The first two of these causes cannot be removed by any process of bleaching; in fact, if such flour were bleached the impurities would be even more noticeable. If flour is discoloured from these causes the remedy is in improved wheat cleaning and milling. It is the third factor that can be corrected by artificial bleaching, and all bleaching processes must be directed to the oxidation of the yellow carotin to its colourless oxidation product.

Development of Bleaching Processes.

The earliest efforts were those of Jago, who found that ozone had some bleaching effect, but the first really useful process was that patented by John and Sidney Andrews in 1901. They used nitrogen peroxide, which they produced by acting on ferrous sulphate by nitric acid. The gas was mixed with air and passed over the flour. The next improvement came in a cleaner and safer method of producing the nitrogen peroxide. In 1903 the Alsop process was patented. In this process air is passed through a flaming electric arc where a small portion of the air combines to form nitrogen peroxide. Many of the nitrogen peroxide bleachers are developed on this principle, though, as would be expected in the thirty years that have elapsed, considerable refinements have been effected in design and method of operation. A later development was the production of nitrogen peroxide by the catalytic oxidation of ammonia. Ammonia is mixed with air and passed through a warmed platinum spiral. The ammonia is oxidised exothermically and, after diluting with cold air, the resulting gases are led to the bleaching chamber. Later on Wesener introduced chlorine as a bleaching agent, and this led to nitrogen trichloride and nitrosyl chloride. Finally organic peroxides, such as benzoyl peroxide, have been employed.

The Dollinger Process.

This process depends on the production of nitrogen peroxide in the electric arc. The treated air is conducted through aluminium pipings to the flour agitators. A pressure of from 10,000 to 15,000 volts has been found to be the most favourable one, the consumption of current being almost negligible. The process is worked as follows: A small compressor produces an air blast which is conveyed over the arc to the gas producer. The current is converted into high tension secondary current which discharges over the arc. The difficulties of the process are mainly mechanical.

The Poetih Process.

This is based on similar principles to the Dollinger process, and depends on the electrical production of nitrogen peroxide. It is very popular on the Continent.

The Stacey Electrified Air Process.

This process, which is used in many English mills, has replaced the older Alsop process, in which a single volume of gas was produced of one strength, then conveyed through galvanised piping to a large tank and eventually distributed between the various grades of flour to be treated. In the Stacey process the gas is generated separately for each run of flour. A powerful gas may be required for one grade, a weak one for another, and a medium for a third.

The Stacey Exothermic Process.

This is quite a cheap process, and takes up very little floor space, and for these reasons is employed by many millers. The plant consists of a small belt-driven air compressor, an air receiver, an ammonia cylinder, the oxidation coil, and as many agitators as there are grades of flour to be bleached. The mixture of air and ammonia is oxidised in a platinum coil to nitrogen peroxide, which is passed through the flour agitator. The only objec-

tions to this process are that oxides other than nitrogen peroxide may be produced if the wrong proportions of air and ammonia are used, and as the reaction is controlled by the intensity of the glow on the coil, errors may be made. Moreover, there is nearly always a smell of ammonia which is objectionable, and, of course, there is sometimes a possibility of sending ammonia through the flour, and this turns the flour brown.

Bleaching by Chlorine.

Chlorine in all probability bleaches by virtue of its oxidising action, according to the equations:

$$Cl_2 + H_2O = HClO + HCl$$
$$HClO + HCl = 2HCl + O$$

It is probably the increase in hydrogen ion concentration due to the liberated hydrochloric acid that accounts for the fact that chlorine is an improver as well as a bleacher. There is also the possibility of the formation of a colourless dichlor addition compound of carotin. Frequently nitrosyl chloride is mixed with chlorine and the mixture is called Beta gas. Usually about ½ per cent. of the nitrosyl chloride is used. One notable objection to the use of chlorine is the curious musty smell that always seems to develop after treatment with chlorine. It is possible that the smell is due to one of the chlorine derivatives of carotin, but the matter does not seem to have been investigated. The gas is usually supplied from cylinders and led into agitators similar to those used for nitrogen peroxide. The determination of residual chlorine after chlorine bleaching is a rather complicated matter.

Bleaching by Nitrogen Trichloride (Agene).

This substance was introduced into milling as a bleaching agent by Baker in 1920 (U.S. patent 1367530/21). The process has become very popular in America, and six years after its introduction it was used by over 400 mills, and about 12,000 sacks per hour were treated. The process consists of treating well-agitated flour with air containing about 1 per cent. NCl_3. The amount of air is about 8 to 10 cu. ft. per sack, so that about 4 gm. NCl_3 are supplied per sack. The air is saturated to 100 per cent. humidity. The reagent is prepared by passing chlorine through an ammonium salt. Hypochlorous acid is first produced which reacts as follows:

$$Cl_2 + H_2O = HCl + HClO$$
$$3HClO + NH_4Cl + NCl_3 + HCl + 3H_2O$$

While the agene process is most popular in America, it should be noted that it is used by a number of millers in this country. Bread made from flour bleached by agene is very white.

All the bleaching agents of the chlorine group are gases, as also nitrogen peroxide, and these offer definite advantages over solids. A gas can be led directly into the rapidly agitated flour and the bleaching is instantaneous. Solids require more elaborate mixing arrangements, and do not act instantaneously. In spite of this one solid bleaching agent is very popular, and certainly gives an excellent bleach—that is, benzoyl peroxide.

Bleaching with Benzoyl Peroxide (Novadel Process).

The agent consists of 1 part of benzoyl peroxide and 3 parts of acid calcium phosphate. The latter is added to reduce the inflammability of the peroxide, which is liable to spontaneous ignition. The mixed powder is added to the flour at the rate of ¼ to ½ oz. per sack of 280 lb. The action depends on the slow liberation of oxygen from the peroxide, and obviously the process takes some time. Actually the best result is obtained after twenty-four hours' action. A special measuring device is available which delivers the required amount of the bleaching agent.

Other Bleaching Agents.

Apart from the bleaching agents enumerated above, several recent patents have been taken out covering the use of other substances. One patent covers the use of nitrosyl sulphuric acid mixed with an equal weight of silicic acid, another treats flour with mono- or di-chloramine or a mixture of these substances. This method is claimed to have all the advantages of nitrogen trichloride without the risk of explosion. In another patent a method of bleaching flour with peroxides in a liquid condition to facilitate more uniform and efficient mixing, and to increase the speed of bleaching, is protected. In this patent substances like diorthotoluyl peroxide, benzoyl acetyl peroxide and orthotoluyl peroxide are quoted as examples. They are used in the ratio of 1:40,000. Finally it is claimed that benzoyl peroxide can be rendered more active by adding small quantities of a fatty acid, such as caproic or oleic acid. No doubt chemists will continue to look for fresh bleaching agents, but the use of nitrogen peroxide, the chlorine group, and benzoyl peroxide is so well established in the industry that unless some really superlative agent is discovered they will predominate.

In conclusion, the recommendations of the Departmental Committee on the Treatment of Flour with Chemical Substances might be quoted: "While we consider that a staple and indispensable foodstuff such as flour, the purity and wholesomeness of which are of cardinal importance to the community, should be jealously guarded against unnecessary treatment with foreign substances, we are not prepared, on the present knowledge available, to recommend the complete elimination of the bleaching agents now in use. Our view is that in the first instance it should suffice to limit the use of these substances to those which appear least open to objection when judged along the lines we have indicated. We think that chlorine, nitrogen trichloride, and benzoyl peroxide should not be amongst these."

It would thus appear that in the opinion of the committee the most desirable method of bleaching is by nitrogen peroxide—either by the exothermic or the electric process.

ENGLISH JAM

Mr. L. Craig Bain, General Manager of the African Canning and Packing Corporation Ltd., Port Elizabeth, criticises an article we published in the July issue on "Standards for Jam." The points he raises are so important that we have added the views expressed by other authorities.

I TURN to an article in your July number, headed "Standards for Jam—The American Viewpoint." That I am doing so after the lapse of some months is consequent upon my absence from office for that period. There is much that I agree with in this article; such, for instance, as the statement that the protection of the consumer gives greatest importance to a country's food laws. I like also the giving of credit to the manufacturer for knowledge of what constitutes a first-quality jam, although I cannot go "all the way" with the contributor in his insistence that products falling short of first quality should not be labelled "jam"; I feel the needs of the situation are met if the sub-standard jams are labelled "Second-Grade Products."

The article ends with an urge to the authorities to ensure that the consumer actually gets what he has a right to expect when buying a jar of jam, and that England should lead the way in establishing *reasonable* standards for jam. So far so good; in fact, very good. This contributor is a fine fellow; let us follow him! On reading him beyond the premises we begin to have mixed feelings, and questions assail us. We try and reconcile the imperative call for only a first-quality jam with the expression "reasonable standards." We assume for the moment that the latter is governed by the former, but what do we find in contributor's later lines? Why, we find an applauding of English strawberry jam having 42 per cent. of strawberries, and blackcurrant jam having only 30 per cent. of blackcurrants, the missing percentages, after providing for the sugar, being found in added fruit juices. What these fruit juices are is not stated, but if apple juice and/or gooseberry juice had been mentioned it would have been near the mark. Now, the presence of these added juices in an English jam (first quality) need not be mentioned on the label, and so a few questions come to mind:

1. Is a jam with so low a proportion as 30 per cent. of the stated fruit standard a first-quality jam?

2. Would the consumer agree that it was such if the fact was disclosed to him or her? Is the housewife getting what she has the right to expect?

3. Are the food laws of England sufficiently modern to ensure the protection of the consumer?

Many people, both in and out of England, regard its food laws as being completely out of date and entirely inadequate. For myself I regard them as being fifty years behind the times. The jam standards in particular have earned much adverse criticism, and a highly placed official in England, in close contact with pure food problems, spoke recently to me of the inadequacy of these standards; but listen to the Birmingham City Analyst in a published report:

> "First-quality jam should be made from fruit and sugar without any addition whatever, and to allow a jam to be labelled as a first-class article when it may contain any number of foreign ingredients is distinctly a retrograde step, and the housewife ought to know that the new labels issued by the Food Manufacturers' Federation, and attached to the jars of jam she buys, guarantee merely a very low content of fruit and nothing else whatever.
>
> "It seems rather extraordinary that, while such countries as the United States, Canada, New Zealand, and South Africa have Acts which give powers to the responsible Minister to make standards for foods and drugs, and which constitute incorrect labelling an offence, we in this country should be content to govern our procedure by an Act which is now fifty-five years old and quite out of date."

And then the Portsmouth Public Analyst:

> "I venture to think that a blackcurrant jam containing only 30 per cent. of blackcurrants is a poor substitute for the old-fashioned variety, and to label it 'Full Fruit Standard' is misleading to the public, and jam made from blackcurrants would not be improved by the addition of extraneous fruit pulp."

It is naïvely stated that the addition of these other fruit juices involves a *greater* cost in manufacture than if only the genuine named fruit and sugar was used, and consequently there is no intention to deceive the purchaser. This is curious, and one asks why, then, in the second standard jams does the manufacturer use a still greater proportion of other juices? Reason would prompt one to think that he does it to reduce his costs. The contributor rather gives contradiction to his statement when he comes to describe "Bred Spred" later on in his article; however, we leave the matter as a question. We cannot do so, however, when we come to the statements made as to why the American and Canadian food laws (and the contributor might have mentioned the food laws of a number of other countries) call for more genuine jams. To quote:

"The reason for these fruit contents, which seem high to English eyes, is to be found in the properties of the strawberries usually employed in jam making in North America, the fruit being much milder in flavour and possessing less body and pectin value than the English strawberry."

"First-quality blackcurrant jam in England need only contain 30 per cent. of fruit in the finished product; Canadian regulations for jams, other than strawberry, require 50 per cent. of fruit in the finished jam, and the United States would require 45 per cent. fruit to 55 per cent. sugar ratio. Using English or European blackcurrants this would result in a consistency resembling asphalt; but the explanation lies in the fact that blackcurrants when grown in the United States are markedly deficient in pectin and flavour compared with the European variety."

Is this a correct statement?

In *The Analyst*, **50**, p. 392 (1930), the Canadian Dominion Chemist's Report gives figures for the pectin content of strawberry jams made in Canada. The average pectin (as calcium pectate) for sixteen samples of jam was 0·28 per cent. Since Canadian strawberry jam contains 55 per cent. strawberries, it is easily seen that the fresh strawberries will contain, on the average, pectin to the extent of 0·51 per cent. This is not far different from the average figure for English strawberries given by Macara (*Analyst*, **51**, 39, 1931) as 0·53 per cent. pectin as calcium pectate. From the same two sources it can be seen that Canadian and English raspberries are practically identical in pectin content.

Data for blackcurrants are not available to us, but we consider it would be difficult to substantiate the statement that "Blackcurrants when grown in the United States are markedly deficient in pectin and flavour compared with the European variety."

The reason for the large differences in fruit contents between American and English jams is assuredly not a difference in the composition of the fruit. English fruits are not so rich in pectin that a small percentage of fruit will produce a jam equivalent to an American jam made with a larger amount of fruit. The English and American jams are distinct types of jam. In the English a jelly consistency, which the consumer presumably desires, is produced *by the addition of pectinous material*, such as apple or gooseberry juice, a fact that the consumer is probably ignorant of. Whereas the American public evidently prefer what one might term a more solid jam, which requires a larger proportion of fruit solids.

Let this American contributor be satisfied with England's standards of jam and her food laws; nobody is thinking of interfering with her in regard to them, but our thought is that the July contributor is easily satisfied.

Other Views

Salford

Mr. H. E. Monk, B.Sc., F.I.C. (Public Analyst for the City of Salford) comments as follows on Mr. Craig Bain's remarks:

To see ourselves as others see us is, in this case, both interesting and instructive. Mr. Craig Bain has managed to lay his finger on nearly all the defects in the present British semi-official standards for jam.

Presumably there is room on the market for jams of all qualities; all that one can reasonably ask is that the purchaser may be able to judge from the description on the label what this quality really is. In this country "Full Fruit Standard" is taken to mean, and is meant to mean, a jam of the first quality. Jam made in the home usually approximates to the well-known recipe of a pound of fresh fruit to a pound of sugar, and one would think manufacturers would be disposed to take the equivalent of this as a minimum standard for a first-quality jam. How far short they may fall can be judged from an actual formula for making "full fruit standard" (damson) jam:

60 lb. sulphited pulp (containing 90 per cent. fruit).
3 gal. = 45 lb. sugared fruit (containing 55 per cent. fruit).
7 lb. pectin.
7 lb. glucose.
90 lb. sugar.

Total ingredients, 209 lb.; boiled down to 182 lb. jam. The sulphited pulp—*i.e.*, two-thirds or more of the total fruit—had actually been in stock for two years.

The question of jam standards is a big one. We have all heard the makers' arguments that the fruit season lasts only a few months, that they must keep workers and expensive plant going all the year round, that to make an article on a large scale which will keep and stand transport is a different problem from that of the home jam maker.

All this is no excuse for the definite fact that the present full fruit standard represents a sad debasement of what first quality should be—*i.e.*, fresh fruit and pure sugar only. If this is as near as the jam manufacturer, aided by modern science, can get to the housewife, one can only deplore the application of science to industry.

Label Declaration *v.* Definite Standards.

The following communication has been received from Mr. D. Henville, F.I.C., Public Analyst for the Metropolitan Borough of Stepney:

In order to comment on the jam standards one is compelled to refer to standards in general. It is stated that this country, with regard to its food laws, is fifty years behind the times as compared with other countries. The whole point lies in the question as to whether standards are desirable or not. In my opinion it would be a great mistake to adopt hard and fast standards for every food. There are admittedly few standards in this country, and those standards sufficiently prove that it would not be to the good of the consumer if standards of this kind were generally provided for each and every food.

The method of arriving at a standard appears to be by means of consultation between the Government department concerned and the trade, and it follows that the standard eventually adopted can only be in the nature of

a compromise. We have only to look at our present standards to see that this is so.

There is no need for standards for such articles of food as pepper, rice, flour, coffee, tea, sugar, etc. A sample of tea is either tea or it is tea plus something else; and flour should be flour only, not flour plus nitrites or persulphates. Rice should be rice, not rice plus talc; and similarly with all foods of a simple nature. There are, however, certain articles of food for which definite standards, not in the nature of a compromise, should be laid down.

In the case of mixed foods there is obviously a real need for protection for the consumer and, incidentally, for the manufacturer; but, in my opinion, there would be no necessity for standards for these products if the exact composition of the article were stated on the label. I cannot see that the article known as lemon curd or lemon cheese (the name in itself means nothing) can be objected to, under the present food laws, whatever it may consist of, as long as it is a palatable article free from deleterious impurities and prohibited dyes and satisfies the requirements of the preservative regulations. No extravagant claims, of course, which cannot be justified should be made on the label.

As a general system and without going into detail, I would, as previously stated, have the maker of every mixed article declare on the label in easily legible print of one size the composition of the product which he is selling. This would automatically cut out the ambiguous wording and implications often found on a label to-day and would satisfy and assist the makers of good products. Further, there should be a declaration of the net weight or volume of the contents.

The jam standards, which are semi-official, constitute a regrettable example of what might happen to the consumer if agreed standards became general.

There is undoubtedly a market for two types of jam. The best jam will always find buyers; but there should be a second-grade, palatable product for those purchasers who require a cheaper article. In each grade the actual composition should be declared on the label. The jam standards say a good deal but actually mean very little of a definite nature.

With the exception of cases of flagrant adulteration, the analyst can do little beyond examination for total soluble solids, arsenic, prohibited dyes, and preservatives.

The standards contain no definition of the composition of jam, neither fresh fruit nor cane sugar being mentioned throughout. There are two qualities—First Quality or Full Fruit Standard and Second Quality or Lower Fruit Standard—and a specific fruit content (varying from 30 to 45 per cent.) is laid down for each quality of jam according to the fruit or fruits used, a footnote giving equivalent quantities of peach and apricot pulp. This appears to imply that, except in the case of peach and apricot, fresh fruit is used. There is, however, no prohibition of the use of strawberry or raspberry or other preserved fruit pulps. A first quality jam need not therefore be made from fresh fruit and refined cane sugar with a high proportion of fresh fruit.

It is further stated that on the label of a mixed jam, where the proportions of fruit are not equal, the name of the fruit forming the larger content shall appear first. In the list of first quality mixed jams we have: Strawberry and gooseberry (40 per cent. fruit, 20 to 20), gooseberry and strawberry (40 per cent., 30 to 10), blackberry and apple (40 per cent., 20 to 20), apple and blackberry (40 per cent., 30 to 10), etc.

Similarly, in second quality mixed jams we have raspberry and gooseberry (20 per cent., 10 to 10) and gooseberry and raspberry (20 per cent., 15 to 5), plum and apple (20 per cent., 10 to 10) and apple and plum (20 per cent., 15 to 5), etc.

A footnote states that the proportions in two-fruit jams not mentioned are to be on the same basis as in those given above.

There may be a particular reason for this ratio, but it would seem that the basis is that the cheaper fruit is in equal proportion when mentioned last and in a proportion of 3 to 1 when mentioned first. This would not be obvious to the purchaser of the jam.

From the analyst's point of view there are many difficulties. The determination of the amount of fruit in a jam is not an easy matter, owing to the wide range of variation in the composition of the fruit. The determination may be made from the amount of insoluble solids, pectin, and acidity found in the sample.

These figures cannot, however, be relied on. The fruit may have been partially expressed for jelly making beforehand, and the insoluble solids would not therefore truly represent the original fruit; the acidity is unreliable, as citric, tartaric, and malic acid may be added without declaration; and the pectin figure may be affected, as no declaration of added fruit juice and/or pectin is required in the case of first quality jams, so that presumably fruit juice and/or pectin may be added. The figure may also be affected by the presence of glucose.

Permitted colouring matters may be added and the addition of glucose is not prohibited. To-day *refined* glucose is largely sold for the benefit of invalids and children.

All jams, however, must contain a certain minimum percentage of total soluble solids, as determined by a somewhat unsatisfactory method.

Finally, the following statement has a somewhat humorous flavour: "Second quality jams must be described by the name of the fruit or fruits together with the words 'With other fruit juice' in letters of equal size, except where in mixed jams no fruit juice or pectin has been added."

(*To be continued.*)

New Companies

J. J. WHIPP, LIMITED. (272886.) To take over the bus. of wholesale confectioners cd. on by J. J. Whipp and Co., at Greengate Confectionery Works, Rochdale. Nom. Cap.: £2,000 in £1 shares.

BETANCOR AND COMPANY, LIMITED. (272708.) To carry on the bus. of mchts., salesmen, importers and exporters of fruit, vegetables, fish, meat, etc. Nom. Cap.: £100 in £1 shares.

ENGLISH GELATINE AND PHOSPHATES, LIMITED. Thames House, Millbank, Westminster, S.W. 1. To carry on the bus. of mnfrs., importers and exporters of and dlrs. in gelatine, phosphates, isinglass, glue, etc. Nom. Cap.: £60,000 in £1 shares.

SOYA FOODS, LIMITED. (272811.) Springwell Lane, Rickmansworth. To carry on the bus. of mnfrs. of and dlrs. in soya bean flour and bread, etc. Nom. Cap.: £100 in £1 shares.

USK VALE POTATO CRISP COMPANY, LIMITED. (272492.) 38, Frogmore Street, Abergavenny. To carry on the bus. of mnfrs. of and dlrs. in potato crisps, etc. Nom. Cap.: £500 in £1 shares.

ARTHUR BAGGOTT, LIMITED. (272835.) 93, Stratford Road, Birmingham. To carry on bus. as mchts., importers and bottlers of and dlrs. in beer, wines, spirits, etc. Nom. Cap.: £1,000 in £1 shares.

WILSON AND MANSFIELD, LIMITED. (271481.) To carry on the bus. of mchts. and genl. commission mchts. and agents formerly cd. on at 15, Philpot Lane, E.C., as "Wilson and Mansfield." Nom. Cap.: £25,000 in £1 shares.

EDIBOL FOOD PRODUCTS, LIMITED. (271763.) 13, East Parade, Leeds. To carry on the bus. of dlrs. in coconuts, cohune and ground nuts, palm kernels, and other vegetable oil-yielding products, etc. Nom. Cap.: £500 in £1 shares.

BENNINGA'S BRITISH MARGARINE AND PRODUCE COMPANY, LIMITED. (271427.) To enter into an agmt. for the acquisition of land at Mitcham; and to carry on the bus. of mnfrs. of and dlrs. in margarine, etc. Nom. Cap.: £25,000 in £1 shares.

BROADHEAD'S, LIMITED. (271546.) 148, High Street, West Bromwich. To carry on the bus. of mnfrs. of bread, cakes, etc. Nom. Cap.: £1,000 in £1 shares.

BRITISH PEPPER AND SPICE COMPANY, LIMITED. (273915.) 31, Queen Victoria Street, E.C. 4. To acquire the whole of the shares in the capitals of Drysdale Dennison and Co., Ltd., and White Palmer and Co. (1931), Ltd.; to enter into agmts. with the latter company, J. S. Gray and the British Shareholders' Trust, Ltd., to carry on the bus. of mnfrs. of and dlrs. in pepper, spices, drugs, etc. Nom. Cap.: £160,000 in £1 shares.

RAWVIT, LIMITED. (273366.) To carry on the bus. of mnfrs. of and dlrs. in foodstuffs, medicines, liniments, etc. Nom. Cap.: £100 in £1 shares.

CHARLES DICKINSON AND COMPANY, LIMITED. (273899.) 8, Serjeants Inn, Temple, E.C. 4. To carry on the bus. of provision mnfrs., importers, and exporters, etc. Nom. Cap.: £2,000 in £1 shares.

RADFORD'S SAUCE, LIMITED. (273500.) To carry on the bus. of mnfrs. of and dlrs. in sauces, etc. Nom. Cap.: £800 in 500 pref. shares of £1 and 6,000 ord. of 1s.

A. BALME AND COMPANY, LIMITED. (273533.) 94-96, Commercial Street, Spitalfields, E. 1. To carry on the bus. of mnfrs., wholesalers, and retailers of biscuits, etc. Nom. Cap.: £2,000 in £1 shares.

PREPARED FARM PRODUCE, LIMITED. (273794.) 194, Scotland Road, Liverpool. To carry on the bus. of dlrs. in farm, garden, and dairy produce, etc. Nom. Cap.: £250 in £1 shares.

CONVOY CONFECTIONS, LIMITED. (273705.) To carry on the bus. of wholesale, retail, and mnfg. confectioners, etc. Nom. Cap.: £1,000 in £1 shares.

WELSH UNITED DAIRIES AND CARTONS, LIMITED. (272205.) To carry on the bus. of dairymen; mnfrs. of and dlrs. in plant, crates, cartons, etc. Nom. Cap.: £8,000 in £1 shares.

KAYES (BECKENHAM), LIMITED. (272482.) To carry on the bus. of bakers, etc. Nom. Cap.: £1,000 in £1 shares.

EAST ANGLIAN VINEGAR COMPANY, LIMITED. (273802.) The Brewery, Pampisford, Cambs. To carry on the bus. of brewers of vinegar, etc. Nom. Cap.: £4,000 in £1 shares.

P. CORNER (HARTLEPOOL), LIMITED. (273796.) The Fish Quay, Hartlepool. To carry on the bus. of fish mchts., etc. Nom. Cap.: £1,500 in £1 shares.

MEDOSWETE PRODUCTS, LIMITED. (273750.) Brown Edge, Kew, Southport. To carry on the bus. of mnfrs. and distributors of spices, poultry remedies, foods, and drugs, etc. Nom. Cap.: £100 in £1 shares.

BLENDERS, LIMITED. (273805.) To carry on the bus. of blenders and millers of flour and cereals, etc. Nom. Cap.: £100 in 1s. shares.

The above-mentioned particulars of new companies recently registered have been extracted from the daily register of Messrs. Jordan and Sons, Ltd., company registration agents, Chancery Lane, W.C. 2.

Cost Control in the Canning Industry (*Continued from page* 160.)

their own sales organisations and are building up their own brand goodwill. This incurs selling office expenses (invoicing, etc.), salesmen's salaries, expenses and commission, advertising, and bad debts. As it usually requires a greater effort to sell a higher priced article, the selling expenses should be recovered on the various products as a percentage on turnover.

7. Profit.

While this is not an item of cost, allowance must be made for its inclusion when fixing selling prices. Up to the present, prices of English canned goods have been rather erratic owing to the urgency of selling the bulk of any one commodity before the new packing season begins, both on account of the need to realise the cash position and also in view of the possible deterioration of a large part of the pack. The fixing of standard prices has been further complicated by the wide variation between the cost of the raw material from season to season. Now that long-term contracts with the growers have been started, annual market price variations should not affect the final cost of canned goods so much and a constant price from year to year should be possible.

It has not been possible in this article to explain the working of an efficient costing system in full, but an endeavour has been made to show how its installation is a sound investment. A standard costing system in the canning industry would prove very helpful and tend to eliminate wasteful productive units.

TRADE NOTES

Welsh Sugar Beet Project.

The Pembrokeshire Agricultural Committee have decided to assist in every way the scheme for the erection of a £300,000 sugar beet factory for the county. It was pointed out at the last meeting of the committee that the climate and soil of Pembrokeshire were eminently suited to the cultivation of sugar beet, and that the county produced the heaviest crop per acre in the country.

* * *

The Bakers' Exhibition.

The schedule of competitions to be held at the Bakers' and Confectioners' Exhibition at the Royal Agricultural Hall in September next is now being formulated, and the committee will meet shortly to consider suggestions and offers of prizes. We have been asked to notify members of the trade who have suggestions to put forward that they should communicate without delay with the manager, Mr. H. S. Rogers, 11, Queen Victoria Street, London, E.C. 4.

The Railway Clearing House have again agreed that visitors to the exhibition may travel by any train at a fare and one-third for the double journey.

* * *

Lecithin in Confectionery.

A booklet arranged in a commendably practical manner has been received from Messrs. A. Boake, Roberts and Co., Ltd. It describes the properties and uses of the company's Collabrac and is entitled *Lecithin: Its Industrial Application in Confectionery*, by A. G. Avent, F.I.C. Copies may be obtained on application to Messrs. A. Boake, Roberts and Co., Ltd.

* * *

Tin Solders.

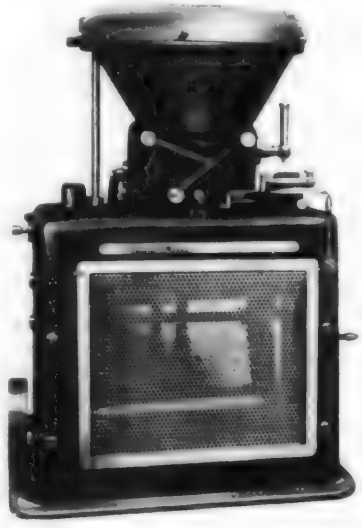
All users of tin solders will be glad to hear that the study on this subject published by the British Non-Ferrous Metals Research Association, *Tin Solders*, by S. J. Nightingale, the first edition of which has for some time been exhausted, is to be reissued shortly.

The work is so written as to be easily comprehensible and of the greatest service to practical users and manufacturers of solders. It is in part a summary of the work carried out in the laboratories of the Metropolitan-Vickers Electrical Co., Ltd., which formed the basis for the first standardisation of solders by the British Standards Institution.

An Automatic Batch Feeder.

A Hansella machine that forms and feeds at even temperature, uniform strips of caramel, toffee, nougat, and similar masses into any cut-and-wrap machine is described in several well-produced pamphlets issued by Hansella, Ltd.

The method adopted in the working



of the machine is claimed to be thoroughly hygienic, and, at the same time, to eliminate stoppages, ensure continuity of wrapping, and yield better shapes. The Hansella is said to increase output up to 20 per cent. per cut-and-wrap machine. The makers will be pleased to furnish any further particulars on application.

* * *

Credit for Canners.

Credit for the Canning Industry is the title of a booklet issued by the United Dominions Trust, Ltd. It supplies information regarding the plan that has been evolved for giving financial assistance to the canning industry during the three stages of organisation, production, and distribution. The financial assistance referred to takes the form of discounting bills at rates agreed in advance. We understand that up to the present the plan, in each of its stages, has met with a very strong measure of success.

Food Machinery.

We are interested to note that Mr. R. C. H. Unwin has joined the staff of Messrs. Bratby and Hinchliffe, Ltd. Mr. Unwin has a very extensive experience of food and chemical machinery, gained through quite a long association with Messrs. Baker Perkins and, subsequently, as a director of Messrs. du Mont, Ltd.

The firm of Bratby and Hinchliffe has been established well over half a century, chiefly as engineers designing and manufacturing machinery for breweries and mineral water factories. In the past few years, however, the firm has greatly developed its food and chemical machinery activities, until the latter now constitutes a very substantial portion of its total output. We understand that in future all matters relating to this side of the business will be dealt with by Mr. Unwin.

* * *

"Coralettes."

In the February issue of FOOD MANUFACTURE an enquiry was published regarding the manufacture of "coralettes." Messrs. Burton, Son and Sanders, Ltd., of Ipswich, have drawn our attention to the fact that this is their registered word and is not, therefore, available for general trade description.

* * *

Change of Address.

The British Aluminium Co., Ltd., Adelaide House, King William Street, London, E.C. 4, have removed from their Birmingham office and warehouse at 21, Barwick Street, to Lawley and Landor Streets. The new telephone number is Aston Cross 5865-6.

* * *

Dust Recovery.

Dust-recovering installations are finding increasing applicability nowadays in a great variety of industrial processes.

Those who are interested in dust recovery and fume elimination should obtain a copy of the latest "Dracco" pamphlet from the Power-Gas Corporation, Ltd.

The "Dracco" fabric filter system, first designed and exploited 15 years ago by the Dust Recovering and Conveying Company of Cleveland, U.S.A., is now very well known in America, and promises, in the hands of the Power-Gas Corporation, to become as much in demand in this country.

It is unnecessary here to summarise details of the "Dracco" equipment, as this has already been done in the pamphlet referred to, in the most concise and practical manner possible.

Canning Machinery.

A new step in the British canning industry has been taken by Messrs. Vickers-Armstrong, Ltd., of Elswick, who have begun the manufacture of Bliss presses, hitherto made only in America.

An arrangement has been reached with the E. W. Bliss Co., of Brooklyn, New York. The machines will also be manufactured at Vickers-Armstrong's, Crayford.

Cmdr. E. R. Micklem, of Vickers-Armstrong, has stated that orders already in hand will provide work for fifty men for six months.

The presses weigh up to 100 tons each, and the canning equipment produces tin cans at the rate of 300 per minute.

* * *

Tangyes, Ltd.

Mr. G. N. Guest, late Managing Director of Hollings and Guest, hydraulic engineers, and John Hands and Sons, power press manufacturers, together with many of his staff, has now joined Tangyes, Ltd., who will be glad to quote for all types of hydraulic machinery and power presses.

* * *

Packing.

In a recent issue of the *Danish Foreign Office Journal* appeared an article on automatic packing machines dealing with the machinery of Messrs. Hartmann Brothers and their Hermeton cartons.

The principle of Hermeton packing is described as a strong outer cover around an airtight and thin inner envelope. The whole process of cutting, folding, filling, pasting, and sealing is automatically carried out by the machine. The inner envelope or lining is completely sealed at both ends, and thus forms an airtight container within the box. The inner lining may be of any suitable material—greased, waterproof, or waxed paper—and is cut to the required shape and size and fixed inside the previously-cut cardboard, with the cut and folding of which it is in perfect register. After the side-flaps of the lining and the carton have been automatically folded down into position, the face-flaps (back and front) of both lining and carton are spread out, a film of paste is applied to the whole of the surface of the face-flaps and they are folded down, so that the face-flaps of the lining are securely gripped between the face-flaps of the cardboard, and the ends of the carton thus become one solid pasted board, making the package absolutely dust-proof and airtight.

The article, in referring to Hartmann's as a firm that has won wide recognition, both in Denmark and abroad, mentions that it is the largest firm of its kind in Scandinavia.

The Weir Homogeniser.

A leaflet just issued by Messrs. G. and J. Weir, Ltd., presents in an attractive manner the special features of their well-known homogeniser, a description of which was published in our November, 1932, issue.

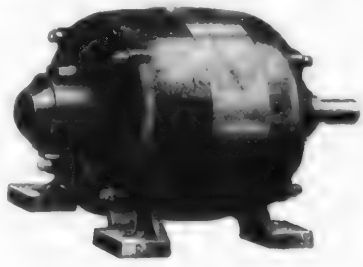
One of these machines was on view at the stand of Messrs. Bratby and Hinchliffe, Ltd., at the recent National Dairy and Ice-Cream Convention at Olympia.

The leaflet, apart from the customary descriptive matter, contains a very clear reproduction of the Weir Homogeniser (100-200 gallons per hour unit). This, of course, is only one of a range of models standardised to cover all capacities from 100 to 1,250 gallons per hour. The pumps are designed for normal pressures at the homogeniser valve of 2,500 lb. per sq. inch, but may easily be adapted for higher pressures if required.

* * *

Fractional H.P. Motors.

For all small power applications where a larger driving unit is unnecessary, a very sound proposition from the works manager's standpoint is a fractional horse-power motor of the B.T.-H. type.



We have recently received matter descriptive of these units from the British Thomson-Houston Co., Ltd., who state that there are now a large number of such motors in use in this country.

* * *

Carton Manufacture.

The stand of the Thrissell Engineering Co., Ltd., at the Birmingham section of the B.I.F. attracted a good deal of attention to the three machines exhibited.

These included rotary cutting and printing machines used for the production of cartons, wrappers, labels, etc., each being displayed at work under conditions closely resembling those of an ordinary factory. It was rather fascinating to watch cartons and labels being produced on the spot from materials supplied by firms well known in the foodstuffs industry. Details of the machines were available on the stand during the period of the show and may now be had from the Thrissell Engineering Co., Ltd., on application.

Estimating Popularity.

How a chocolate manufacturing firm investigated the public's likes and dislikes is referred to in the annual report for 1932 of the National Institute of Industrial Psychology. The Institute's investigators interviewed over 10,000 representative consumers and retailers in London, Birmingham, Cardiff, Glasgow, Leeds, Manchester, and Newcastle. Questionnaires were completed at each interview and the replies analysed. Assorted chocolates from France, Holland, Germany, Canada, America, the Balkans, and other countries, were examined for comparative purposes. A large number of tasting tests were then conducted on a wide range of specially prepared chocolates in order to determine consumer preferences on such points as flavour and consistency of centres, flavour and thickness of chocolate covering. A selection was thus made of the best chocolates for inclusion in a new assortment.

* * *

Can Cleaning.

Peroklean is a detergent that is said to find special application in the food industry, being employed to quite a large extent by canners to free cans from oil and dirt accumulations. In addition it is used for cleaning the usual range of utensils—porcelain, tiles, paintwork, glasswork, etc.; and is described as antiseptic, non-abrasive, and non-poisonous. Further information may be had from the makers, Messrs. Peroklean, Ltd.

* * *

Canadian Canned Salmon.

In addition to the recent order that cans of salmon are to be marked with a letter indicating the variety of salmon used, the Canadian Government has just issued another, forbidding their Board of Inspection to pass as first grade any salmon not landed at the cannery within twenty-four hours after the catch, unless it has been gutted and iced immediately on being caught. The fact that so rigid a regulation has been passed is a tribute to the standard of skill and speed in handling which the canners themselves have set up, and is to be regarded as a valuable guarantee of quality to the consumer.

* * *

An Interesting Representation.

We have just received a notification to the effect that Messrs. Robert Kellie and Son, Ltd., the well-known food and chemical engineers of the Dundee Foundry, Dundee, have appointed Messrs. Charles E. Douglas and Co., Ltd., engineers, as their sole agents for and in the South of England generally.

The address of Messrs. Charles E. Douglas and Co., Ltd., is 213-215 Cecil Chambers, 76, Strand, London, W.C.2.

INFORMATION and ADVICE

APPLE BUTTER—BRAWN—STERILISING FLOUR—MILK PRESERVATION—PACKING DATES—EGG SEPARATORS—CHICKEN PACKING—JUNKET POWDER—TOMATO PRODUCTS—MEAT GLAZE—"JARAH"—EGG PRESERVING

Apple Butter.

1,217. *Please give instructions on how to make apple butter as made by Heinz in America.* (Australia.)

We have no knowledge of the methods used by Heinz in preparing this.

In America several methods are in use, and in absence of full particulars of your special circumstances, we can only give a general reply to your question.

Apple butter is made from fresh apples, apple pulp, fresh apple trimmings, or dried apple slices called "chops."

In preparing the butter from fresh apples, which are mostly windfalls and culls, it is necessary to give them a good washing. The apples are then cooked in a tank with an open steam coil, together with a small quantity of water. The pulp obtained is run through a pulper. The same treatment is given to fresh apple trimmings.

Use 100 gallons of pulp (500 pounds of apples), 30 gallons of boiled cider, 8 ounces ground cinnamon, 4 ounces ground cloves, 4 ounces ground allspice, 150 pounds granulated sugar or the same amount of "C" sugar. ("C" sugar or brown is often used as some think it improves the flavour.) The boiled cider used is sweet cider, concentrate 4 to 1.

Run into a pan as much pulp as can be conveniently handled without boiling over; start the stirrer, add the sugar, and then gradually add the balance of the pulp and boiled cider while cooking. The sugar and cider are added early to aid in producing a brown colour. The spice is not added until ten minutes before the batch is finished to avoid loss in flavour. Mix the ground spice with about ½ gallon of cold water until smooth before adding to the batch. Dry spice added may form into a mass and not mix thoroughly in the batch. Allspice is often omitted because the tannin present may produce darkening. A very small amount of oil of pimento can be substituted; about ⅛ to 1 ounce to 100 gallons of finished butter. A steam siphon may be used to transfer the pulp to the cooking kettle. The finished batch is run through a finisher to remove any pieces of cores, skins, etc., not removed by the first pulper. This also helps to blend or mix the fruit butter. Fill into containers as hot as possible, seal immediately, and process.

Apple Butter from Dried Apples.

Dried apples or chops	110 lb.
Granulated sugar	100 ,,
Boiled cider	90 ,,
Ground cinnamon	1 ,,
Ground allspice	8 oz.
Ground ginger	6 ,,

Cook the apples in 40 gallons of water, using live steam for one hour, and then pass through a pulper. Cook this pulp with the sugar and one-half of the boiled cider for one hour and add the balance of the cider.

Mix the spices together with water to form a smooth paste and add about 15 minutes before the batch is finished. This makes an excellent, spicy, tart butter.

1,218. *I shall be obliged if you will give me any information as to where I can obtain necessary particulars for the manufacture of edible fats, including dripping and baking fats.* (Glasgow.)

This matter involving highly technical details, the enquirer was referred to the services of an expert.

1,219. *Can you give us any information regarding ingredients used in the manufacture of the highest class ice-cream?* (London.)

Reference was made to the various articles on the subject which have appeared in this journal and a further source of information recommended.

Brawn.

1,220. *Your name has been forwarded to me as a firm most likely to be able to give some information on the manufacture and preservation of brawn in warm weather.* (Essex.)

The following points should be observed:

It is essential that as clean meat as possible be used. All brawn should be made from cured meat, and in warm weather it is essential that the meat be thoroughly cured in a pickle of 60° to 70°, the pickle to be kept as cold as possible. Spoilage of brawn during warm weather is due to bacterial agencies, and success of manufacturing depends on keeping down the growth of bacteria as much as possible.

When the containers are filled with brawn and jelly solution, they should be cooled as rapidly as possible in a clean atmosphere, not in an atmosphere laden with dust and bacteria. The next day the brawn should be kept in cool store, awaiting despatch. Do not use remnants of jelly and gelatine that have been lying about from one day to another.

1,221. *We would like to get in touch with an English firm making odourless wooden pails, similar to American wooden lard pails.* (Leyton.)

After making extensive enquiries we were unable to obtain the required information. If any reader can help us we shall be pleased to pass on particulars to the enquirer.

Sterilising Flour.

1,222. *We shall be glad if you will kindly give us the name of a manufacturer of a machine or process for the sterilising of cereal flour.* (Midlands.)

We understand that a considerable amount of work on this question has been carried out by Dr. Fisher at the Flour Millers' Research Laboratories, and that a suitable machine has been developed. Application for information should be made to Dr. Fisher. You might also look up the patent literature on the subject.

1,223. *Kindly supply particulars of the manufacture of jellies in block form.* (Australia.)

This subject has been dealt with fully in previous issues of this journal. Reference should also be made to the *Food Industries Manual.*

1,224. *We should be obliged if you would let us have the names and addresses of wholesale firms supplying spices such as cloves, cinnamon, mace, herbs, salt, pepper, etc.* (London.)

These were given.

1,225. *We should be greatly obliged if you could inform us whether you know or list any publication which deals with the methods of wrapping and packing of such food products as biscuits, confectionery, dates, nuts, and similar small commodities that require protection of cellophane and cartons.* (Surrey.)

Information supplied.

1,226. *We are considering purchasing a vacuum can-seaming machine, and should appreciate hearing from you, if you know of any English manufacturer who could supply a machine of this type.* (London.)

Names of suitable firms were supplied.

Milk Preservation.

1,227. *I am running a dairy and shall be extremely obliged if you will be good enough to advise me how unboiled milk, not stored in a refrigerator, can be retained for, say, 18 to 20 hours in summer without getting sour or deteriorated in any other way.*

Any other useful hints in this connection—e.g., whether the ordinary washing soda can effectively, and without any danger to the quality of milk, be used in cleaning pails, bottles, etc. (India.)

It is obvious that all the usual precautions should be taken to ensure clean, sterile handling, transport, and utensils. How long the milk will keep after pasteurisation under your climatic conditions we do not know. You will have to experiment. The same care to guard against infection during storage in properly sealed and sterile containers will have to be exercised.

Utensils, etc., may be cleansed with a good detergent and may be washed out with a solution of hypochlorite of soda and hot water. Cans and bottles should also be steam or (in the former case) dry-heat sterilised.

Packing Dates.

1,228. *We note that you apparently have a service department or information bureau in connection with your publication. We are very much interested in securing a process for treating dates that are repacked from regular seventy-pound cases into one- and two-pound packages. These without treatment dry out and become more or less unsaleable; consequently, the necessity of some treatment either with glycerine or sugar syrup that will keep them in a moist saleable condition.*

If you have this information or can suggest where we might secure it, we would appreciate same very much. A straight glycerine solution or even a dilute glycerine solution is too expensive, while a sugar solution would no doubt ferment. A combination of both in the proper proportion might be suitable. (Canada.)

Nature provides a skin for hermetically sealing dates, and in packing them tight the avoidance of air is assisted. Thus, care should be taken to prevent the skin being broken, which would result in the dates becoming dried up.

In cases where the skins are broken, the material is dipped into special solutions at 180° to 190° F., and then they are packed warm and the top wiped over with a clean cloth moistened with glycerin. The boxes after packing should be sealed as tight as possible. Soda water may be used for washing off any trace of fermentation.

Solutions for packing are as follows:

No. 1.	Water	4 gal.
	Glucose	4 lb.
	Gum arabic	4 oz.
	30 per cent. acetic acid	1 fl. oz.

Dissolve the gum in cold water, then add glucose and boil; after which add the acetic acid.

No. 2.	Water	4 gal.
	Gum arabic	4 oz.
	Pure salt	1 ,,

Dissolve the gum arabic in cold water, and then add the salt and boil.

1,229. *Please inform us where we can obtain an apple extract, something like pectin, which will set into a jelly almost immediately by the addition of a second article sold in conjunction with it and called a "fixing agent." Probably it is grape acid or cream of tartar.* (Liverpool.)

Suggestions were made.

1,230. *Where can we obtain information on the manufacture of piping jelly, ginger crush, and compound lard and margarine?* (Scotland.)

The May, 1931, and February, 1932, issues of this journal published information on piping jelly. The manufacture of margarine has also been dealt with in two articles. Sources of information on the subjects of compound lard and ginger crush were indicated.

Egg Separators.

1,231. *I have been informed that there is a machine on the market for separating the white from the yolk of an egg in connection with the liquid egg trade.*

I would be very much obliged if you could give me any information as to whether or not such a machine exists and, if so, who are the manufacturers. (Ireland.)

We have not come across any special machine for separating the whites and yolks. We understand that the usual practice in the States and elsewhere is to crack the egg on a blunt knife, and a perforated tray or cup is fixed an inch or two below the knife. On breaking, the yolks are not damaged by the short fall into the cup, while the albumen drains through into a receptacle below.

It would seem that this is quite a simple operation, but one that really demands skilled labour. If, however, there is a mechanical method of separating eggs we should be glad to have particulars from our readers.

Chicken Packing.

1,232. [*An enquirer recounts certain troubles he is experiencing in packing chicken in glass and asks for advice.*] (Scotland.)

We are afraid that we cannot give you any definite advice on the points you raise. In order to do this, it would be necessary to have full details of your procedure previous to processing. Read M. Cheftel's articles in the present and previous issues.

The first thing that springs to the mind is that your processing is not being carried out correctly in respect of time and temperature; the only way to determine this is by making a series of tests, varying the time, and having the product examined by a competent food chemist or bacteriologist.

The difficulty is that although 240° F. for fifty minutes may be adequate for a normal product, yet, owing to the presence of bacterial spores, the time and temperature you name would not be drastic enough.

From your description, it appears that the sealing is all right. The trouble really seems to be connected with bacterial spoilage, caused by some source of infection, either from the chicken, gelatine, or some other source. Attention should be paid to the cleaning and dressing operations.

1,233. *Can you recommend a reliable firm who manufacture colourings for meat and fish pastes? The colours must not, of course, be liable to fading during the sterilisation process.* (Scotland.)

This was done.

1,234. *Your paper came in yesterday, and we were very interested in the paragraph on the first page, under the heading "Onion Peeling," regarding the Australian manufacturer who subjects his onions to a fierce gas flame for three seconds and then allows them to roll down an incline, thus burning off the skins. If you could put us in touch with this pickle manufacturer we should be greatly obliged.* (Canada.)

The name and address of the manufacturers of the machine in question were forwarded.

1,235. *We should be obliged to be put in touch with a reliable manufacturer or importer of anchovy essence.* (Liverpool.)

Probable sources of supply were indicated.

1,236. *Do you know of a tool for inserting wire label staples into soft wood? We shall be very pleased to receive prices and particulars of an inexpensive instrument for this purpose.* (South Wales.)

Names of likely suppliers were forwarded.

1,237. *Can you let us know who are the manufacturers of the enclosed "knock-down" container? This has been used for soft cheese. Also can you give us name of manufacturers of the "Ereky" parchment containers? Can you give any advice as to a suitable machine for filling these and similar containers with soft cheese?* (Yorkshire.)

Information supplied.

Junket Powder.

1,238. *We should be greatly obliged if you could favour us with a formula for the preparation of junket powder.* (London.)

We understand that these are made from a very weak dried rennet, which is mixed with a certain amount of salt and sugar and the flavouring added in a liquid state. The mixture is then dried under vacuum and put up into packets. It has to be kept absolutely airtight, as otherwise it takes up moisture very quickly, and becomes useless. The amount of rennet used is very small, but it is rennet, not pepsin.

Tomato Products.

1,239. *We are interested in securing a guaranteed formula from a reputable chemist for the making and preserving of tomato paste and tomato preparations in general.* (Bahamas.)

We have published several articles on this subject—namely, Tomato Canning and Tomato Purée in the October, 1932, issue, and Tomato Juice in the December, 1932, issue.

With regard to tomato catsup, quite a comprehensive article is to appear in the June issue.

This subject of tomato products is a very large one indeed, and it is absolutely impossible to give you any useful information in the course of ordinary correspondence. If, however, you will state just what particular product you are interested in, we shall be glad to give you assistance of a general character, but if you require detailed help and guidance in the manufacture of these products, we would be glad to put you in touch with a chemist over here.

A few recipes were supplied by way of illustrating the principles involved.

1,240. *Can you supply formulæ for meat paste, salmon paste, and kindred lines?* (Liverpool.)

The enquirer was referred to articles published in the June and July, 1932, issues.

1,241. *Can you recommend a reputable chemist who would undertake to analyse and report upon an infant food?* (Midlands.)

Suggestions were made.

1,242. *We should like to have additional information on the subject of cream canning beyond what you published in your March, 1932, issue.* (Yorkshire.)

Presumably you require practical instructions. The best way is to address your enquiry to the makers of the necessary plant, whose addresses we are giving you.

1,243. *Please state the time and temperature necessary to retort sausages in 1-lb. tins.* (Natal.)

We should say that it will be necessary to process the canned sausage at 240° F. for about fifty minutes.

The time, however, can only be determined with any degree of accuracy by actually carrying out a series of tests, and having an examination made of the results by a competent food chemist or bacteriologist.

1,244. *We shall be obliged if you will give us information as to the formulas and processes of manufacture of genuine fruit extracts, a good English ginger beer, a golden ginger ale, and a pale dry ginger ale.* (Lebanon, Penna.)

The manufacture of fruit extracts was fully dealt with in an article published in the December, 1932, issue.

As for the other products mentioned, the most practical, useful information is contained in literature issued by Stevenson and Howell, Ltd., and W. J. Bush and Co., Ltd.

Meat Glaze.

1,245. *We shall very much appreciate any information you can give us in regard to the manufacture of clear marmalade, fine shred.*

Can you also let us have a recipe for a pure white meat glaze? We have tried several methods but have not as yet found an absolutely pure white glaze, such as that turned out by "X.," Ltd. (England.)

As regards the first question, we have published several articles on this subject. Convenient reference may be made to the *Food Industries Manual.*

We have previously given in these columns a recipe for white meat glaze which runs as follows:

Clear white gelatine	25	parts
Farina or cornflour	25	,,
Water ... ... approx.	50	,,
Salt ... ... ,,	2	,,

The gelatine is soaked in water for about an hour, and dissolved in its own absorbed water. The farina or cornflour is mixed with the necessary amount of water to make a thin cream and added to the gelatine solution along with the salt and enough water to make the required weight.

The mixture is kept hot until incorporation is completed, and rubbed through a fine hair sieve and cooled to the required temperature for dipping.

In order to work out a recipe to produce a glaze similar to that of "X.," Ltd., the services of a food chemist would be required.

1,246. *We have received an enquiry from abroad for the names of producers in this country of horseradish powder. We should be very grateful if you would kindly advise us whether there are any firms here producing this powder, and, if so, could you let us have their names and addresses?* (London.)

A likely source of supply was indicated.

1,247. *We shall be pleased if you can give us any information or formulæ concerning the manufacture of cheap toffee.* (Sunderland.)

This enquiry being of a very general nature, the enquirer was referred to a suitable expert.

1,248. *As a subscriber to* FOOD MANUFACTURE *I beg to enquire if you are able to inform me who are the manufacturers of A and C vitamins in concentrated form.* (Copenhagen.)

Information supplied.

1,249. *We should be glad if you could indicate where we could obtain recipes for the preparation of briskets, brawns, and other pressed foods.* (London.)

This was done.

"Jarah."

1,250. *We have an enquiry from a client of ours for a preparation called "Jarah" or "Blood Wood." She is endeavouring to make a marmalade somewhat similar in taste to Oxford marmalade, which we understand is made in Liverpool, and she is advised that the above preparation would be suitable. Can you give us any information as to "Jarah," as to its suitability, and what part it would be likely to play in the manufacture of marmalade?* (London.)

We have never heard of "Jarah," unless it is the same as "Jarrah," a eucalyptus oil which Baker and Smith (*Pharm. Jour.*, 1905, vol. 75, p. 383) obtained from *Eucalyptus marginata* growing in South-West Australia. This appears very unlikely, however.

So far as we know Oxford marmalade is a straight orange marmalade, and we cannot imagine that anything of the nature of "Jarah" is necessary in marmalade making.

Possibly one of our readers may be able to throw light on this question.

1,251. *We are anxious to have some details as to the method of calculating quantities of arsenic and antimony in paper.*

Is it possible that you can help us in any way, either by giving us details of the methods adopted in the trade or referring us to a source of definite information? (Cumberland.)

The enquirer was referred to the services of an expert.

1,252. *We have an enquiry for apparatus for straining honey in quantities of 3 to 4 cwt. at a time, and shall be glad of any information you can give us in respect to this,*

or who would be likely to be in a position to quote for the necessary plant. (Gloucester.)

This was dealt with.

1,253. *We have received an enquiry from a customer who has the catering contract for a large public park for ice-cream containers.*

The customer stipulates that no ice is to be used, and we presume that the only alternative is compressed carbon dioxide.

We should be glad if you could put us in touch with some firm or firms who manufacture apparatus suitable for this work. (Liverpool.)

This was done.

Egg Preserving.

1,254. *I have got your address as being able to instruct us as to the preserving of liquid whole eggs in tins.* (Ireland.)

We presume you refer to the freezing method of preparation, and with this in view the following information may be of assistance to you.

Frozen eggs or, more properly, frozen egg products, consist of (1) unseparated egg meats, *i.e.*, "whole" or "mixed" eggs, (2) yolks, and (3) whites. The meats are removed from the shells, frozen solid, and so held in air-tight tin cans until thawed out for immediate use. In the large market centres, chiefly during the height of the breaking season, there is considerable production of "chilled" whole eggs, yolks, and whites, prepared as for freezing but only partly congealed, and contained in large cans similar to milk cans. These are delivered to users as fast as prepared, and result in a small saving on freezing and carrying charges, and on containers, as the large cans may be used repeatedly. Possibly as much as 10 per cent. of the egg meats are delivered in the chilled form. Dried egg products consist of dried whole egg, yolks and whites, the latter being known in the trade as egg albumen.

The shelled eggs normally are chilled and then candled to remove those not desired for freezing. If not previously chilled, this may be done after candling, in order to facilitate the separation into yolks and whites in the breaking room.

Skilled women break the eggs by striking on a blunt knife-edge. If not to be separated, the meats are then dropped into a small cup. The latter is emptied into a large container after every second or third egg is broken, but is first smelled to detect possible mustiness. These cannot be isolated in the candling room, and one of them can ruin the meats of several cases of eggs. If a musty egg is found the contents of the cup are dumped, and the container is washed and sterilised before being used again.

If separation is to be made into yolks and whites, a small concave sieve is attached beside the knife-edge and above the cup for the whites. The sieve catches the yolk, which is then deftly emptied into an adjoining cup. Unseparated eggs and egg yolks are churned to obtain a homogeneous mixture before pouring into cans for freezing. The whites are not agitated, as this would damage them for use after thawing. When the standard tins are solidly frozen, a small additional quantity of liquid is poured in, if necessary, to obtain the proper net weight. The cans are then sealed and held at a temperature of about 15° F. until shipped.

1,255. *We should like to know how to prevent fat collecting and showing at the top and round the sides of meat pastes in glass.* (Ireland.)

This is caused by shrinkage, excessive fat, failure to soak the filler, or insufficient filler.

1,256. *In* FOOD MANUFACTURE *for February there is a description of a vanilla flavour—"Vanillal." As we are rather interested in this we shall be glad if you will let us have the address of Messrs. A. W. Munns and Company.* (Midlands.)

This address was forwarded.

1,257. *We have heard that many firms that pack fish pastes in bottles do not make it themselves, but buy it ready made, in bulk, from the Continent.*

Can you inform us of any address where this is obtainable, or give us any information which will enable us to get in touch with the makers? (London.)

After considerable investigation we are still unable to supply the required information.

1,258. *I shall esteem it a favour if you will kindly put me in touch with manufacturers of vacuum ice-cream freezers, household refrigerators, and ice chests, as I have a special enquiry for same from clients in India.* (London.)

Names and addresses of suitable firms were given.

1,259. *We should be very pleased to receive names and addresses of a few firms marketing paper covers and twine for jam jars.* (Lancs.)

Names and addresses forwarded.

1,260. *Will you please give us names of makers of wood-wool teasing machines?* (London.)

We have been unable to trace anything definite in this connection. Can any of our readers oblige?

1,261. *Would you kindly give a list of references to literature of applications of solid carbon dioxide as a refrigerant, especially any of interest to the fishing industry?* (Ireland.)

This was dealt with.

1,262. *I have read with much interest the article headed "Bottle Cleaning" published in the February number of* FOOD MANUFACTURE, *and trust that you are in a position to give me useful indications concerning the thorough and satisfactory cleaning of tin cans for preserves soiled by grease. What chemicals or ingredients would best suit the purpose and what would be the process?* (France.)

Suggestions were forwarded.

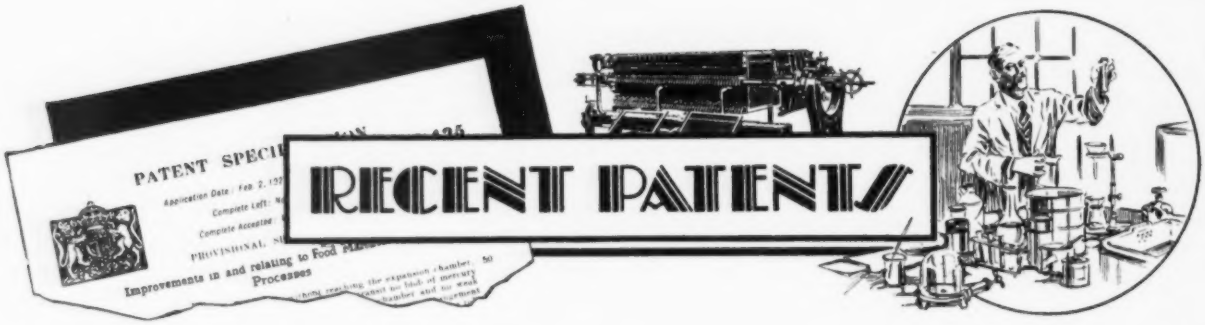
1,263. *We should be glad to know where to obtain egg-shaped metal tins for making Easter cakes; also a source of supply for a second-hand steam boiling pan for making jam and lemon curd.* (Scotland.)

Sources of supply were indicated.

Readers who wish to make enquiries are invited to complete and return to us the special Enquiry Form to be found amongst the advertisement pages.

Beet Sugar Factory in Sussex

Despite the fact that so far the beet sugar industry has only been possible by virtue of Government subsidies, there does not appear to be any sign of curtailing the number of factories; in fact, new ones are contemplated. The latest is in Sussex, and a site has been chosen near Chichester. Plans are in preparation for a factory which will be equipped with the latest beet handling, crushing, and refining machinery, with ample provision for storage and transport. Negotiations are proceeding with farmers in Sussex and Surrey, where the soil is particularly suited to beet growing, for the laying down of about 10,000 acres of sugar beet. The scheme will enable many farmers to keep in production land which would otherwise be turned over to grass for milk production, a state of affairs that has already caused considerable overproduction in many parts.



These particulars of New Patents of interest to readers have been selected from the "Official Journal of Patents," and are published by permission of the Controller of H.M. Stationery Office, and the "Official Journal of Patents" can be obtained from the Patent Office 25, Southampton Buildings, London, W.C. 2, price 1s. weekly (annual subscription £2 10s.).

Latest Patent Applications

9319. CLARE, A. J.: Bandages for cheeses. March 28.

9685. LEICESTER, P. H.: Machines for manufacture of pies. March 31.

9872-9873. SMITH CO., G. A., and SMITH, G. A.: Food-slicing machines. April. 1.

9435. TRIGGS, W. W. (DAITZ PATENTS FOUNDATION): Maintaining sprinkling capability of tablesalt. March 29.

Printed copies of the full Published Specifications may be obtained from the Patent Office, 25, Southampton Buildings, London, W.C. 2, at the uniform price of 1s. each.

Abstracts Published

Group Abridgments can be obtained from the Patent Office, 25, Southampton Buildings, London, W.C. 2, either sheet by sheet as issued on payment of a subscription of 5s. per group volume, or in bound volumes price 2s. each.

385,654. **Food preparations.** LEWIN, G. E., Bridge House, Felstead, Essex.
A solid chemical combination of iodine and milk for human or animal use is obtained by mixing iodine or a suitable compound thereof with dried milk or dried butter-milk and then heating to a temperature—*e.g.*, 70° C.—at which chemical combination between the iodine and the milk occurs. In a modification, iodine—*e.g.*, the resublimate—or a suitable compound—*e.g.*, potassium tri-iodide—is added to liquid milk and the mixture is heated to 40° to 100° C., and the resulting liquid sprayed on the dried milk. The solid obtained may be dried, if necessary, and milled. The heating may be effected in a closed vessel.

385,050. **Preserving fruit.** NIETO, C. A., 2666, Victoria Street, Buenos Aires.
Fruit is preserved by coating it with Portland, Roman, or lime cement, which forms a solid airtight covering, and then packing in sawdust, shavings, sand, coal dust, cork, dust, or other granular or powdered material and finally storing, if desired, in a cold chamber.

Recent Trade Marks

This list of Trade Marks of interest to readers has been selected from the "Official Trade Marks Journal," and is published by permission of the Controller of H.M. Stationery Office. The "Trade Marks Journal" can be obtained from the Patent Office, 25, Southampton Buildings, London, W.C. 2, price 1s. weekly (annual subscription £2 10s.).

GOLDEN PHEASANT.—534,735. **Melons (fresh fruit).** NIVEN AND MITCHELL, LIMITED, 18, Denman Street, London, W. 1. Mar. 8. (By Consent.)

WILKINSON.—530,155. **Sugared almonds and liquorice sweetmeats.** W. R. WILKINSON AND CO., LIMITED, Ferrybridge Road, Monkhill, Pontefract. Mar. 8. (Associated.) Advertised before acceptance, the applicants alleging distinctiveness.

TIGER.—535,519. **Fresh Jaffa oranges.** ALEXANDER HINDI, trading as Alexander Hindi and Company, 15, Victoria Street, Liverpool. Mar. 8.

DEXTRA.—536,292. **Boiled sugar confectionery.** WALLER AND HARTLEY, LIMITED, 8, Birley Street, Blackpool. Mar. 8. (Associated.)

ZOLEINE.—537,768. **Refined maize oil for use as food or as an ingredient in food.** WHITE, TOMKINS AND COURAGE, LIMITED, 48, Mark Lane, London, E.C. 3. Mar. 8.

MILADY DEXTRO.—536,293. **Boiled sugar confectionery.** WALLER AND HARTLEY, LIMITED, 8, Birley Street, Blackpool. Mar. 8. (Associated.) Registration of this Trade Mark shall give no right to the exclusive use of the word "Dextro."

ER-BRA.—538,353. **Beverages (not alcoholic, not aerated, and not medicated).** MACKS, LIMITED, 67 and 68, Rylance Street, Ardwick, Manchester. Mar. 8.

PALACE.—537,819. **Fish.** MENDES FERRARI AND FURTADO, LIMITADA, Rua Dr. Bastos, No. 40, Portimão, Portugal. Mar. 8.

WIDDECOMBE FAIR.—538,382. **Confectionery.** TUCKER AND SONS, LIMITED, 73 and 75, High Street, Totnes. Mar. 8. (Associated.)

FULTONA.—538,908. **Confectionery and chocolates.** The Firm trading as MONRO AND FULLERTON, 14, Coulter's Lane, Glasgow, S.E. Mar. 8.

SAL-PATE.—537,308. **Substances used as food or as ingredients in food, but not including salt and not including any goods of a like kind to salt.** EMMA LOUISA ROPER, trading as the Home-Foods Company, Orchard Road, Richmond, Surrey. Mar. 1.

PEASACH.—538,800. **Toffee, chocolate, and sugar confectionery.** WALTER'S "PALM" TOFFEE, LIMITED, Palm Works, Westfields Road, Acton, London, W. 3. Mar. 1.

RAYDACREME.—538,629. **Ice-cream.** GRADACREME COMPANY, LIMITED, Rolle Road, Torrington, Devonshire. Mar. 1.

ROSE.—530,607. **Tea.** ISAAC FESSEL, 80, High Street, London, N. 16. Feb. 22. (By Consent.)

MAID OF HONOUR.—535,101. **Cereals for use as food.** RATHKENNY AGENCY, LIMITED, Ulster Model Creameries, Ballymena Road, Rathkenny, Co. Antrim, Northern Ireland. Feb. 22.

WAFESNIPS.—535,227. **A cereal food.** O. KAVLI AKTIESELSKAP, Lodin Leppsgate 2, Bergen, Norway. Feb. 22. (Associated.)

HONIJEALA.—535,334. **Honey and food preparations made from honey.** THE BE-ZE-BE HONEY COMPANY, LIMITED, Be-Ze-Be Factories, Buckingham Avenue, Trading Estate, Slough, Buckinghamshire. Feb. 22.

HYKADE.—537,157. **Preparations for making beverages, but not including cocoa and chocolate, and not including any goods of a like kind to cocoa and chocolate.** JEWSBURY AND BROWN, LIMITED, Mineral Water Manufactory, 7, Ardwick Green North, Ardwick, Manchester. Feb. 22.